

**GLOSOLAN-V/21/Report**



**Food and Agriculture  
Organization of the  
United Nations**



# **Report of the fifth meeting of the Global Soil Laboratory Network (GLOSOLAN)**

Virtual Meeting, 23-35 November 2021

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Food and Agriculture Organization of the United Nations  
Rome, 2021

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## 1. Introduction

Based on the decision made at the fourth GLOSOLAN meeting (November 2020) and considering the status of the COVID-19 pandemic, the fifth meeting of the Global Soil Laboratory Network (GLOSOLAN) was organized virtually using the Zoom Video Communications® platform. The meeting lasted three hours per day from 23 to 25 November 2021 (see agenda in Annex I) and was attended by 328 participants from 100 countries (see list of participants in Annex II). Mr Ronald Vargas (Secretary of the Global Soil Partnership, FAO) opened the meeting by remarking the important role of laboratories in producing reliable soil data. Mr Vargas acknowledged the contribution of GLOSOLAN in creating a platform where laboratories and institutions could exchange experience and knowledge, highlighting the need to downscale and implement activities at the national level. Mr Vargas also shared his view about the upcoming challenges on soil that GLOSOLAN should help addressing. In this regard, soil laboratories play a key role in providing good quality data for those indicators used to assess the effect of soil practices to mitigate climate change (e.g. carbon sequestration into soils) and monitor the main soil threats (soil erosion, soil fertility, soil pollution, soil biodiversity loss, soil salinity). Mr Vargas concluded his remarks by thanking Ms Nopmanee Suvannang and Mr Rob de Hayr for supporting GLOSOLAN as Chair and vice-Chair respectively in 2019-2021. Although a Chair and vice-Chair will be elected during the 5<sup>th</sup> GLOSOLAN meeting, Mr Vargas hoped for Ms Suvannang and Mr de Hayr to remain active members of the network.

Ms Nopmanee Suvannang (GLOSOLAN Chair) thanked participants for their commitment to implement network activities. She provided a brief overview of some of the main achievements of GLOSOLAN since its establishment back in 2017, and shared her astonishment and satisfaction about the great results accomplished, including establishing collaborations with other GSP Pillars of Action. Ms Suvannang stressed how the network took advantage of the Covid-19 pandemic and the increasing adoption of virtual meetings to enlarge its impact. Ms Suvannang closed her opening speech by recalling the spirit of collaboration and mutual support of GLOSOLAN, and by encouraging participants to contact the GLOSOLAN coordinators to receive assistance to improve their analytical performance and overcome the issues faced in their routinely work.

## 2. Report of the work performed by GLOSOLAN in 2020-2021

Ms Nopmanee Suvannang, GLOSOLAN Chair, opened her intervention by reminding participants the goals of the network; to get laboratories worldwide to produce good (precise and accurate) results, and to get laboratories to obtain similar results. At present, laboratories registered in GLOSOLAN produce data with different levels of accuracy and precision. However, all laboratories can improve if they help each other and with the support of GLOSOLAN.

On 21 November, 2021, the network had 760 laboratories registered. Figure 1 shows the geographical distribution of laboratories registered in GLOSOLAN. Detailed information on GLOSOLAN members are available on the [GLOSOLAN interactive map](#).

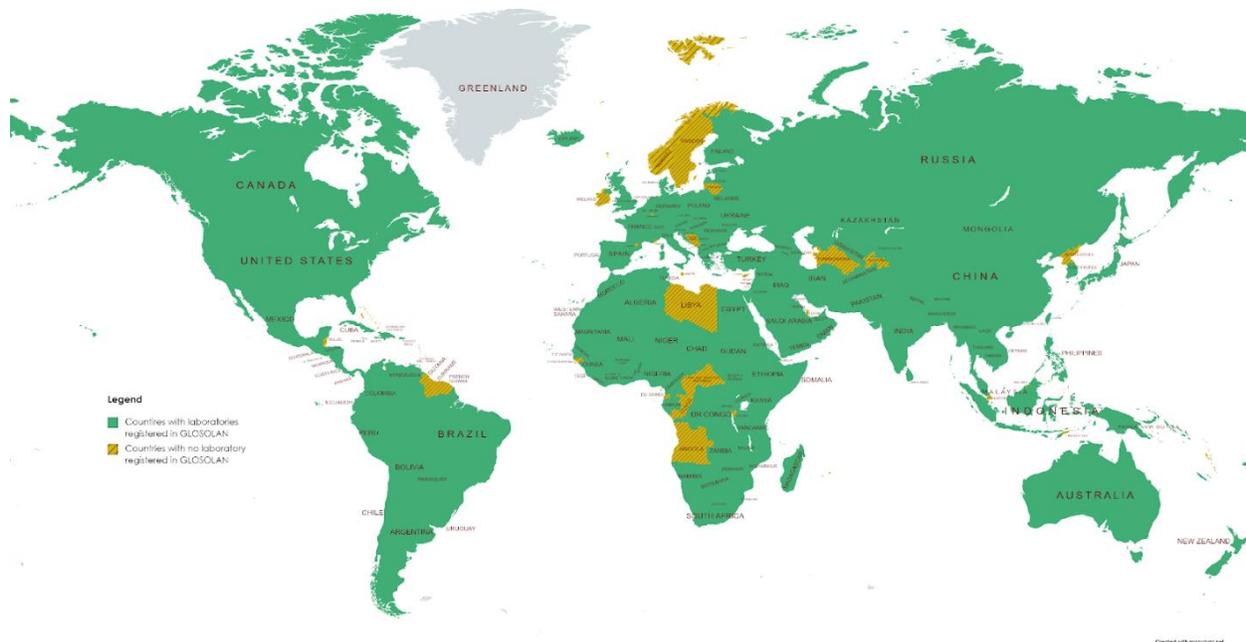


Figure 1. Map of GLOSOLAN members worldwide. Countries in green represent those in which at least one laboratory is registered in the network. Countries in yellow are those with no members registered yet.

Ms Suvannang recalled that GLOSOLAN is doing its best to keep its website updated, available in the six UN languages with sections answering frequently asked questions. In this regard, she thanked GLOSOLAN members that volunteered to translate GLOSOLAN material. Her acknowledgments were extended also to all those laboratories that volunteered to record video training, which are available on YouTube with subtitles in several languages. Looking at the **material published** by the network in 2020-2021, this consists of:

- Nine standard operating procedures
- Three training videos on the implementation of standard operating procedures on the Walkley and Black method and the Tyurin method. Videos are available with subtitles in six languages
- Two global assessments
- One poster on the role of soil laboratories
- Fifty-one GLOSOLAN-related documents in Arabic, Chinese, French, Russian, Spanish and Turkish

Please note that many more documents (meeting reports, training material, etc.) are under finalization.

Ms Suvannang continued by reminding participants that based on the decision made at the 4<sup>th</sup> GLOSOLAN meeting in November 2020, the meetings of the Regional Soil Laboratory Networks (RESOLANs) have focused on decision making only. In this regard, all trainings are being implemented in the form of **webinars**. GLOSOLAN is organizing webinars on each topic in different languages and at different times to facilitate the participation of as many regions and countries as possible. In 2021, nine webinars on wet chemistry, one webinar on health and safety and six webinars on soil spectroscopy were organized. Overall, webinars on wet chemistry were attended by 1420 participants from more than 120 countries.

Webinars on soil spectroscopy were attended by 2607 participants from 142 countries, and webinars on health and safety were attended by 250 participants from 58 countries.

Additional information on GLOSOLAN training opportunities are available on [GLOSOLAN’s capacity development webpage](#). On behalf of the GLOSOLAN coordinators and the Global Soil Partnership, Ms Suvannang thanked the 24 trainers from 16 different countries and 6 regions that prepared and implemented the webinars.

Ms Suvannang reported progresses on the writing of the **GLOSOLAN SOPs 2020-2021** by presenting Table 1.

Table 1. Update on the harmonization of the GLOSOLAN SOPs 2020-2021

PHYSICAL PARAMETERS	Status
particle size-distribution by pipette method	Writing of the SOP ongoing
particle size-distribution by hydrometer	One regional harmonized matrix missing
bulk density	Harmonization of the global matrix
moisture content by gravimetric method	Writing of the SOP ongoing
CHEMICAL PARAMETERS	
Particulate organic carbon by physical fractionation	Global matrix under review by the WG
Quasi-total elements by digestion using aqua regia and EPA. This includes total heavy metals	Global matrix under review by the WG
Exchangeable bases and CEC by ammonium acetate	One regional harmonized matrix missing
Available micronutrients (Fe Zn Cu Mn Mo Ni Cd) – extraction using DTPA	Harmonization of the global matrix
Boron by hot water extraction	Harmonization of the global matrix
Mehlich III for macro and micronutrients (including S and B)	Writing of the SOP ongoing
BIOLOGICAL PARAMETERS	
Microbial biomass C and N by chloroform fumigation-extraction	Harmonization of the global matrix
Microbial enzyme activities	Matrix under completion by GLOSOLAN members doing this analysis
Soil respiration rate	Writing of the SOP ongoing

Looking at the organization of the **GLOSOLAN PT 2021**, this will involve 280 soil laboratories worldwide. Selected laboratories will receive a set of 10 self-seal bags of soil labeled with a unique sample code. Each self-seal bag contains 10g of homogenized soil material. Laboratories that will participate in the GLOSOLAN PT 2021 will be selected based on:

- Geographical balance: GLOSOLAN will involve at least one laboratory per country
- Number of parameters (from a given list) that interested laboratories can measure
- Method of analysis (from a given list) that the interested laboratories can perform
- First come, first serve basis. This applies in case the number of laboratories interested in participating to the PT exceed the number of samples available.

PT results must be submitted using a dedicated [platform online](#).

Ms Suvannang continued by updating GLOSOLAN on the **procurement** of laboratory equipment. In 2020-2021, GLOSOLAN delivered equipment to 16 laboratories in 16 countries that participated in the GLOSOLAN PT 2019 and demonstrated no need for training. Information on the equipment provided to each laboratory are available on the [GLOSOLAN equipment interactive map](#).

Ms Suvannang concluded her intervention by informing GLOSOLAN members that the network succeeded in implementing all activities in its 2020-2021 work plan except the following:

- **Activities still under implementation:**

- GLOSOLAN Terminology: the GSP identified the best way to report the GLOSOLAN terminology online in order to make it a living tool. The GLOSOLAN coordinators are finalizing the retrieval of definitions from trainers.
- Monitoring the implementation of the Terms of Reference of the National Reference Laboratories: no survey was sent to the national reference laboratories regarding the implementation of their TORs. However, GLOSOLAN has been monitoring their performance through the establishment of the National Soil Laboratory Networks.
- Organization of the GLOSOLAN PT 2021: the large scale of this exercise caused some delay in the timely launch of the PT. However, the shipment of soil samples will start in January 2022.
- Harmonization of the Standard Operating Procedures decided at the 4<sup>th</sup> GLOSOLAN meeting.
- Update of the FAO Bulletin 74: started and ongoing.

- **Activities that were not possible to implement:**

- Purchasing of equipment for good performing laboratories in the GLOSOLAN PT 2021: not applicable because the results of the PT2021 are not available
- Publishing the units of measure endorsed by GLOSOLAN at its 4<sup>th</sup> meeting and preparation of conversion tables: units of measure were published in the 4<sup>th</sup> GLOSOLAN meeting report. However, GLOSOLAN missed to prepared specific material on the topic because of the lack on manpower.
- Publishing material on soil sampling for analysis of soil biological parameters and other training material as needed: some draft material were prepared but need to be improved. GLOSOLAN aims to implement this activity with the support of the International Network on Soil Biodiversity (NETSOB).
- Presenting the discussion on transfer functions at the RESOLANs meetings: postponed
- Preparing a quick-reference guide to building a transfer function for harmonization: this activity was not implemented after being assigned to the GLOSOLAN Technical Committee. Although the establishment of a Technical Committee was discussed and endorsed at the 4<sup>th</sup> GLOSOLAN meeting, this was still an imperfect body in 2021.

## 2.1 Report of the GLOSOLAN Initiative on Soil Spectroscopy (GLOSOLAN-Spec)

Mr Eyal Ben Dor, GLOSOLAN-Spec Chair, reminded participants that the GLOSOLAN initiative on soil spectroscopy (GLOSOLAN-Spec) was launched in April 2020 with the purpose of building the capacity of soil laboratories on the use of this technology, by bringing together institutions and experts from all around the world to foster best of practices utilization. The main achievements of the GLOSOLAN-Spec initiative in 2020-2021 were:

- Publication of the Global soil Spectroscopy Assessment / spectral soil data: needs and capacities. The survey was completed by 97 laboratories and experts from 56 different countries. The assessment provided an overview of the current expertise, capabilities, needs and priority areas

for labs that want to start or improve their spectral measurements and modelling. The main issue is the lack of equipment and training and building a spectral calibration library under an agreed standard and protocol scheme and a modeling capacity.

- Identification of 11 regional champion laboratories on soil spectroscopy: information is available on the interactive map [here](#).
- Organization of six webinars with questions and discussion sessions: a total of 5959 registrations from 142 countries. A total of 2607 participants joined the live sessions.
- Soil spectroscopy training material: a document on “a primer on soil analysis using visible and near-infrared (vis-NIR) and mid-infrared (MIR) spectroscopy” was drafted and will be published at the beginning of 2022. Six video courses on soil spectral modelling in R will be released in 2022. These refer to the implementation of the “Soil spectral inference with R” book.
- The 2<sup>nd</sup> GLOSOLAN-Spec meeting was organized in November 2021: 254 participants from 80 countries. During the meeting, two decision documents on the review the GLOSOLAN-Spec objectives and governance were endorsed. Ultimately, it was decided for the GLOSOLAN-Spec to have only one working group, one Chair and one Steering Committee. Still, GLOSOLAN-Spec will focus on national capacity development and will engage an international effort to establish a global soil spectral library, through the implementation of the following objectives:
  1. To support the development of all types of soil spectroscopy at national, regional, and global levels.
  2. To support countries in establishing their own soil spectral laboratories and national soil spectral libraries with standardized methods and decentralized estimation services.
  3. To continuously support the development of the global spectral estimation services by encouraging countries to share part of existing national soil spectral libraries on a voluntary basis.
  4. To support the development of standards and protocols for soil spectroscopy, including but not limited to soil sample preparation, measurement protocols, quality assurance, and data analysis and modelling.

In 2022, GLOSOLAN-Spec will focus on organizing a proficiency test for regional champion laboratories, collaborating with P4005 IEEE SA working group on soil spectral standard and protocol, arranging summer schools for soil spectral measurements and data analyses, preparing a cost action proposal, and preparing an academic (credential) course with ranked experts on soil proximal sensing.

## 2.2 Report of the International Network on Fertilizer Analysis (INFA)

Mr Wesley Feldmann, INFA Chair, reminded participants that the INFA network was established in December 2020 as a sub-network of GLOSOLAN and in support to the implementation of the International Code of Conduct for the Sustainable Use and Management of Fertilizers (Fertilizer Code). The link between INFA and the Fertilizer Code is reported in Figure 2.

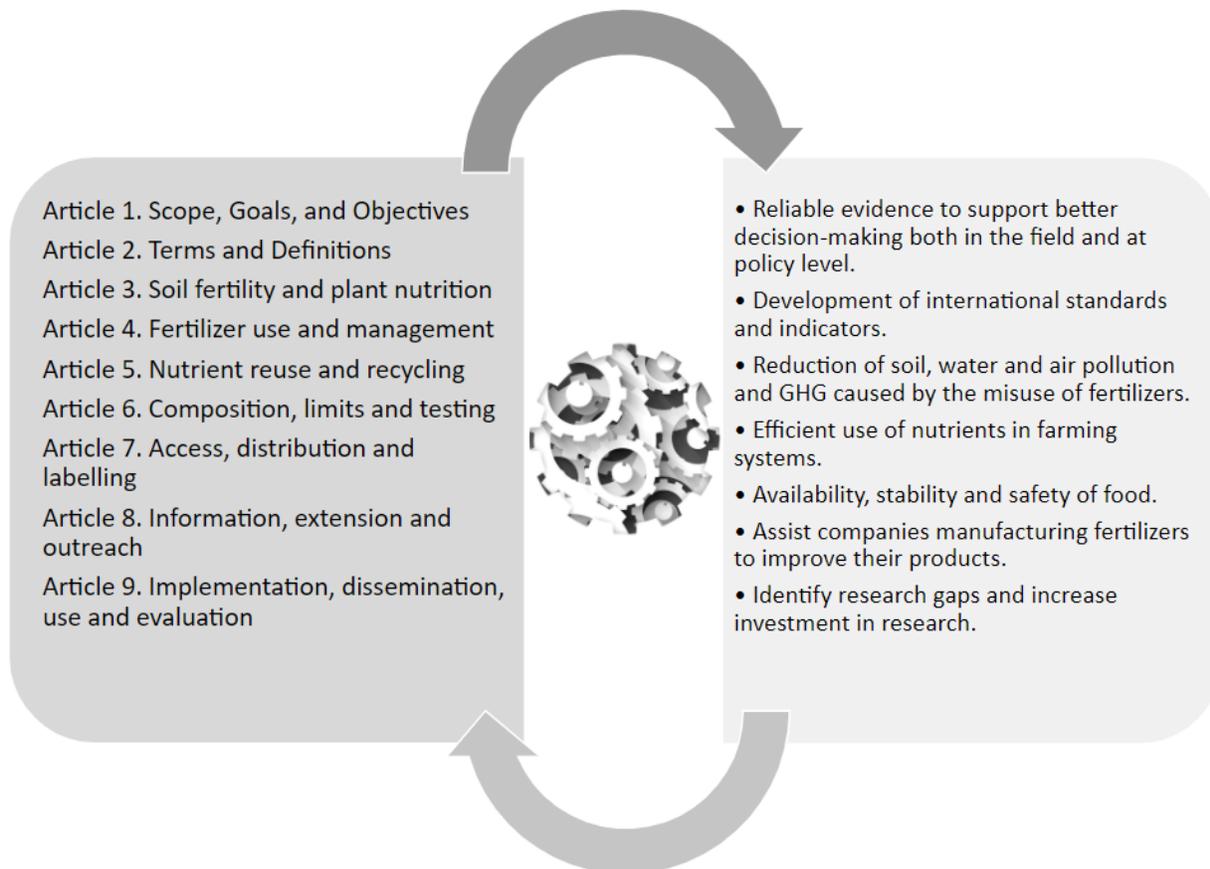


Figure 2. Fertilizer Code and INFA in evaluating fertilizers quality

INFA supports the implementation of the Sustainable Development Goals, the Agenda 2030 for Sustainable Development, and the FAO mandate on food security and nutrition. Globally INFA consists of 142 laboratories analyzing or interested in analyzing fertilizers.

Investing in harmonized fertilizer quality standards for sustainable soil management; (i) supports laboratories for assessment of fertilizer quality, (ii) provides information for informed decisions for fertilizer application and related soil health, (iii) assists to avoid the misuse of fertilizers, and (iv) prevention is better than cure for soil health. In this regard, INFA is committed to:

1. standardize methods and protocols for the analysis of fertilizers
2. strengthen the performance of fertilizer laboratories
3. harmonize fertilizer quality standards for the purpose of policy and regulations.

After its launch in December 2020, INFA held its second meeting in June 2021 to define and endorse INFA's objectives and indicators of performance, and discuss and outline its three working groups:

**Working group 1: harmonization of protocols and methodologies for fertilizers analysis.**

Initial work to be completed using mineral/synthetic fertilizers. The greatest need for network WG-1 will be sub-divided into three groups:

- WG-1a: nitrogen
- WG-1b: potassium
- WG-1c: phosphorous

### **Working group 2: capacity building/strengthening**

Initial focus on laboratory support to best results for working group 1. WG-2 will be subdivided into three groups:

- WG-2a: sample preparation (for laboratory analysis)
- WG-2b: quality assurance
- WG-2c: fertilizer testing instrumentation

### **Working group 3: governance, policy and regulation**

Information-gathering from multiple sources. WG-3 to gather information for each of the INFA members country-regulations relating to fertilizer quality.

In 2021, INFA made the following progresses in implementing its work plan:

- proposed structure for standard operating procedures (GLOSOLAN SOPs adapted to fertilizers)
- review of the current analysis methods (i.e. ISO, IDA, CEN and AOAC)
- development of a database listing the fertilizer requirements for each country
- proposal for a proficiency test (assists with all working groups).

Future work and projects of each working group:

- Working group 1: expand to include secondary nutrients and heavy metals, and expand to include other fertilizer types, i.e. organic
- Working group 2: expand to include all stakeholders within the fertilizer production and distribution line, and focus on environmental research relating to fertilizer use
- Working group 3: creation of the fertilizer database, and development of quality testing guidelines for market entry.

Other activities refer to the proposal for proficiency test for fertilizers.

## **3. Regional Soil Laboratory Networks (RESOLANs)**

Mr Filippo Benedetti, GLOSOLAN alternate coordinator, invited the Chairs of the Regional Soil Laboratory Network (RESOLANs) to present the main outcomes of their annual RESOLAN meeting with a focus on regional main needs. RESOLAN inputs will serve to identify network priorities and to define the GLOSOLAN work plan for 2022.

### **3.1 Asian Soil Laboratory Network (SEALNET)**

Ms Gina P. Nilo, SEALNET Chair, mentioned the efforts done by several SEALNET members to establish their National Soil Laboratory Network (NASOLAN). Ms Nilo informed that the main needs of SEALNET are, in order of importance:

- provision of regular training on SOPs, implementation of internal and external QC procedures, laboratory management, laboratory health and safety, soil spectroscopy, and equipment use and maintenance;
- harmonization of Standard Operating Procedures (SOPs);
- adoption of more modern methods (e.g. soil spectroscopy), as well as more sustainable (reduced risk for the human health, reduced risk for the environment) methods for soil analysis;
- adoption of quality control (QC) procedures;
- adoption of health and safety measures in the laboratory;
- better waste management policies;
- support for accreditation to international organizations.

Ms Nilo also shared the proposal of SEALNET to establish a Center of Excellence in Soil Laboratories (CESLab) in Asia, that would serve as a platform to support GLOSOLAN and the GSP in organizing training, facilitating the implementation of GLOSOLAN SOPs, providing soil samples for external quality control exercises, and sharing best practices on soil analysis-related topics. Such proposal could be potentially implemented in all regions.

### 3.2 African Soil Laboratory Network (AFRILAB)

Ms Lesego Mooketsi-Selepe, AFRILAB Chair, informed participants about the current status of the African Soil Laboratory Network, providing participants with an overview of the activities implemented in the region in 2021. The main priorities of AFRILAB members are, in order of importance:

- provision of regular training on SOPs, laboratory management, equipment use and maintenance, implementation of internal and external QC procedures, and soil spectroscopy;
- adoption of more modern methods (e.g. soil spectroscopy), as well as more sustainable (reduced risk for the human health, reduced risk for the environment) methods for soil analysis;
- harmonization of Standard Operating Procedures (SOPs);
- adoption of health and safety measures in the laboratory;
- adoption of quality control (QC) procedures;
- support for accreditation to international organizations;
- better waste management policies.

Ms Mooketsi-Selepe expressed also, the need for financial assistance in research projects and the organization of national and regional meetings. Moreover, she shared the proposal to organize training sessions on the interpretation of soil data, as many times laboratory staff members are asked by customers to provide advice on the meaning of soil analytical results. This would also allow laboratories to relate different soil parameters and to develop transfer functions. Finally, Ms Mooketsi-Selepe highlighted the importance of proceeding with research in soil analysis, to regularly update SOPs and to discover new applications of cutting-edge technologies to soil analysis.

### 3.3 Latin American Soil Laboratory Network (LATSOLAN)

Ms Miriam Ostinelli, LATSOLAN Chair, presented the main needs of laboratories operating in Latin America and the Caribbean, which are, in order of importance:

- adoption of more modern methods (e.g. soil spectroscopy), as well as more sustainable (reduced risk for the human health, reduced risk for the environment) methods for soil analysis;

- adoption of quality control (QC) procedures;
- adoption of health and safety measures in the laboratory;
- improved infrastructure (e.g. facilities, storage, internet connection, etc.);
- harmonization of Standard Operating Procedures (SOPs);
- support for accreditation to international organizations;
- provision of regular training on SOPs, implementation of internal and external QC procedures, laboratory management, soil spectroscopy, laboratory health and safety, and equipment use and maintenance;
- better waste management policies.

### 3.4 European and Eurasian Soil Laboratory Network (EUROSOLAN)

Mr Oguz Can Turgay, EUROSOLAN vice-Chair for the European countries, reported that Europe and Eurasia are in need of:

- adoption of more modern methods (e.g. soil spectroscopy) for soil analysis;
- harmonization of Standard Operating Procedures (SOPs);
- adoption of quality control (QC) procedures (both internal and external);
- provision of regular training on SOPs, soil spectroscopy, equipment use and maintenance, and implementation of internal and external QC procedures.

Mr Turgay stressed that more efforts (also in terms of communication) should be put to enhance the interest and participation of laboratories in EUROSOLAN and GLOSOLAN activities. Another focus was made on the importance of conducting comparative studies on the harmonization of methods, leading to the development of transfer functions and the preparation of scientific articles to share the network achievements. Mr Turgay informed participants that EUROSOLAN put great effort towards translating GLOSOLAN material in Russian, to overcome language barriers and involve more laboratories from Eurasia. Additionally, an advisory-assistance service was provided for the set-up of new soil laboratories, to be used as an example for other RESOLANs. Finally, he remarked the importance of establishing a concrete and permanent dialogue between governments and soil laboratories to monitor the activities of the latter and to develop proper policies to support laboratories.

### 3.5 Near East and North African Soil Laboratory Network (NENALAB)

Mr Abdelmjid Zouahri, NENALAB Chair, informed participants that NENALAB experts greatly contributed to the development and translation of GLOSOLAN material in Arabic. Still, laboratories in the region are in need of:

- adoption of health and safety measures in the laboratory;
- harmonization of Standard Operating Procedures (SOPs);
- provision of regular training on SOPs, soil spectroscopy, equipment use and maintenance, and the implementation of internal QC procedures;
- adoption of quality control (QC) procedures.

### 3.6 Pacific Soil Laboratory Network (ASPAC)

Mr Rob de Hayr, facilitator of Pacific Soil Laboratory Network (ASPAC), reminded participants about the link between GLOSOLAN and the Australasian Soil & Plant Analysis Council (ASPAC), and the role of the

Council in implementing soil laboratory activities in the region and in the Pacific Islands especially. Mr de Hayr reported that the priorities of the soil laboratories in the region are:

- adoption of more sustainable methods for soil analysis;
- provision of regular training on SOPs, equipment use and maintenance, implementation of internal and external QC procedures, laboratory management, soil spectroscopy, and laboratory health and safety;
- harmonization of Standard Operating Procedures (SOPs);
- support in retrieving reagents and consumables;
- adoption of more modern methods (e.g. soil spectroscopy) for soil analysis;
- better infrastructure (e.g. facilities, storage, internet connection, etc.);
- better waste management policies;
- adoption of quality control (QC) procedures;
- support for accreditation to international organizations;
- adoption of health and safety measures in the laboratory;
- Technical assistance by manufacturers.

### 3.7 North America

Although no formally defined and monitored Regional Soil Laboratory Network currently exists in North America, GLOSOLAN mainly operates in the region through the United States Department of Agriculture (USDA). For this reason, Mr Christopher Lee from the USDA - Natural Resources Conservation Service, Soil and Plant Science Division, National Soil Survey Center, Kellogg Soil Survey Laboratory, reported on the main needs of GLOSOLAN members from North America. These are:

- harmonization of SOP;
- improve the connection among soil laboratories operating in the region and USDA, as well as increase the participation of North American institutions in the network. The latter should be used as a platform to share experience and develop cooperation opportunities.

Mr Lee pointed out that as long as a proper network in the region is not established, a way to facilitate the collaboration between North American laboratories and GLOSOLAN might be the potential involvement of USDA in other RESOLAN meetings, as an observer or external advisor.

### 3.8 Establishment of regional Steering Committees

Building on the extraordinary experience of the Latin American Soil Laboratory Network (LATSOLAN), GLOSOLAN proposed that all RESOLANs establish a Steering Committee to support the Chair and Vice-Chair(s) in triggering and implementing national and regional actions. During their annual meeting, all RESOLANs agreed on this proposal. Thus, the RESOLAN governance will look as follows:

- one RESOLAN Chair
- one or two RESOLAN Vice-Chairs
- one Steering Committee composed by a few active members of the network

RESOLANs also agreed to adopt common Terms of Reference for their revised governance. Ms Caon, moderated the discussion on the endorsement of this document that is available in Annex III. Ultimately,

Ms Caon presented the proposed composition of the Steering Committees of each RESOLAN that will be further discussed during the first governance meeting of each RESOLAN that will take place right after the 5<sup>th</sup> GLOSOLAN meeting.

Proposed members of the AFRILAB Steering Committee:

- Rolf Mabicka Obame, Gabon. Status: Confirmed
- Sadick Adams, Ghana. Status: Confirmed
- Abdourahaman Moustapha, Niger. Status: Confirmed
- Belinda Kaninga Kapmbwe, Zambia. Status: Confirmed
- Njeru Gachini, Kenya. Status: TBC
- Hanane Aroui, Senegal. Status: Confirmed
- Joseph Uponi, Nigeria. Status: Confirmed

Proposed members of the NENALAB Steering Committee:

- Sandra Yanni, Lebanon. Status: TBC
- Yara Khairallah, Lebanon. Status: Confirmed
- Fassil Kebede, Morocco. Status: Confirmed
- Hana'a A Burezq, Kuwait. Status: TBC

Proposed members of the SEALNET Steering Committee:

- Ch.Sreenivas, India. Status: Confirmed
- Nopmanee Suvannanag, Thailand. Status: Confirmed
- Renuka Silva, Sri Lanka. Status: Confirmed
- Jamyang, Bhutan. Status: Confirmed
- Husnain, Indonesia. Status: Confirmed

Proposed members of the EUROSOLAN Steering Committee:

- Agnes Navi, Hungary. Status: Confirmed
- Christian Hartmann, France. Status: Confirmed
- Špela Velikonja Bolta, Slovenia. Status: Confirmed
- Aldis Butlers, Latvia. Status: Confirmed
- Giorgi Ghambashidze, Georgia. Status: Confirmed
- Representative for Eurasia - Vacant

Members of the LATSOLAN Steering Committee:

- Daniel Carreira, Argentina
- Daniel Vidal, Brazil
- Maria Suarez, Dominican Republic
- Ana Silbermann, Uruguay

Advisor to the Steering Committee: Jorge Etchevers, Mexico

ASPAC and the North American region will continue with their current governance. In this regard, they will not establish any Steering Committee.

## 4. Standard Operating Procedures

During the harmonization of GLOSOLAN SOPs in 2021, working groups faced some delay because of the little adoption of some methods worldwide and the lack of experts on some methods, to take leadership in the harmonization process. For this reason, it was decided to:

- Ask specific RESOLANs to take the leadership over the harmonization of SOPs of regional interest;
- Cooperate with other networks (see section 4.1) to harmonize or develop SOPs on parameters related to soil salinity, soil pollution and soil biodiversity. In this regard, experts from other networks could either join the working groups or the review panels.

### 4.1 Collaborations with other GSP Technical Networks

Cooperation opportunities were discussed with the following networks, which were established by the GSP over the years to implement topic specific work plans:

- **International Network on Soil Biodiversity (NETSOB)**

The GSP dedicated great attention to the topic of soil biodiversity in 2020-2021. *“The State of knowledge of soil biodiversity: status, challenges and potentialities”* report was published in 2020, World Soil Day 2020 was dedicated to *“keep soil alive, protect soil biodiversity”*, and the Global Symposium on Soil Biodiversity – GSOBI21 was organized in 2021. Ultimately, an International Network on Soil Biodiversity (NETSOB) was launched in December 2021. The network aims to bring soil biodiversity experts and existing initiatives together, in order to become the critical mass that contributes to the implementation of the Global Soil Biodiversity Observatory (GLOSOB).

Ms Rosa Cuevas (GSP Secretariat, coordinator of NETSOB) presented the main areas of work of NETSOB:

- I. measurement, assessment and monitoring of soil biodiversity;
- II. sustainable use and management, and conservation of soil biodiversity;
- III. economics of soil biodiversity;
- IV. policies and legal instruments related to soil biodiversity.

The potential areas of cooperation between GLOSOLAN and NETSOB mainly concern the harmonization of the standard operating procedures for soil biological parameters:

- NETSOB experts to join and (if possible) lead GLOSOLAN working groups and review panels on the harmonization and update of GLOSOLAN SOPs;
- NETSOB experts to update already published SOPs on soil biological parameters;
- NETSOB to propose the SOPs on soil biological parameters to harmonize to GLOSOLAN, according to their relevance for the research on soil biodiversity indicators.

- **International Network on Black Soils (INBS)**

Mr Yuxin Tong (GSP Secretariat, coordinator of the INBS) spoke about the main activities that were implemented since the establishment of the network in 2017. The context behind the launch of this technical network was recalled as well: considering the great importance of black soils and their risk of severe degradation, it is crucial to promote their conservation and sustainable use, and to unlock their

potential in the longer term to support food security while protecting the environment and mitigating climate change. Many soil properties used to describe a black soil and to monitor its status were already harmonized by GLOSOLAN or are under finalization (e.g. SOC, base saturation, CEC, etc.). For this reason, there is a clear mutual interest in working together to review and update such SOPs. Moreover, GLOSOLAN will work with INBS experts to explore potential applications of more sustainable methodologies for soil organic carbon determination, as most laboratories used practices which were recognized to bring a high risk for both human health (handling of reagents) and the environment (waste disposal).

- **International Network on Salt Affected Soils (INSAS)**

Ms Maria Konyushkova (GSP Secretariat, coordinator of INSAS) briefly described the thematic areas covered by the four working groups of the network:

- SAS&Assessment: mapping, assessing and monitoring of salt-affected soils (SAS);
- SAS&SSM: sustainable management (SSM) of salt-affected soils (practices, policy);
- SAS&Crops: halophyte agriculture and salt-tolerant crops and plants;
- SAS&Water: integrated soil and water management under saline/sodic conditions.

Ms Konyushkova highlighted that experts working on mapping, assessing and monitoring salt-affected soils (SAS&Assessment) are those more interested in collaborating with GLOSOLAN, as the harmonization of SOPs on soil salinity, sodicity and alkalinity were identified as part of their work plan for the years 2021-2022. Topics on which INSAS and GLOSOLAN may work together are:

- harmonization of SOPs for soil indicators used to study salt-affected soils, such as:
  - o soil saturated paste.
    - The SOPs [published by GLOSOLAN](#) should be reviewed in order to include:
      - particular soil conditions (e.g. coarse-textured and high-SOM-content soils);
      - preliminary testing with 1:5 soil/water extract;
      - a coefficient of variation (to be developed after a PT);
    - o Exchangeable Sodium Percentage (ESP);
    - o Sodium Adsorption Ratio (SAR);
    - o alkalinity in soil saturated paste extract;
    - o boron;
    - o soil particle size analysis (texture adapted to soil salinity);
  - samples storage (to avoid precipitation of cations and alkalinity);
  - guidelines for soil sampling (design, volume and homogenization of samples).

#### 4.2 Range values and reference values

The GSP asked GLOSOLAN to work on range and reference values to facilitate the provision of recommendations to farmers and other stakeholders. Range values indicate the range of validity of the method. E.g. Method X is reliable for SOC content from xx to yy. This information should be included in the GLOSOLAN SOPs. Reference values provide an indication on the status of soil according to the result of the sample analysis.

Ms Ostinelli and Mr Benedetti presented the opinion of each RESOLAN on this proposal. After discussion, participants agreed on the following:

- **Range values** may be added to GLOSOLAN SOP, but these should consider a series of influencing factors, such as equipment used, environmental conditions in the laboratory, etc.
- **Reference values** should be developed in collaboration with other GSP technical networks and Pillars of Action, as these need a comprehensive and integrated approach and cannot be carried out by GLOSOLAN alone. Therefore, GLOSOLAN proposed the GSP Secretariat to start a stock taking exercise on the already-produced literature for each soil parameter. After that, working groups should be established to work on reference values, with the contributions of GLOSOLAN experts who will join the working groups.

#### 4.3 Sustainability of methods

As agreed during the 4<sup>th</sup> GLOSOLAN meeting, all GLOSOLAN SOPs will be paired with details on their sustainability, taking into account:

- risk to human health\* related to the use of chemicals and the overall implementation of the procedure by staff;
- environmental risk (waste disposal)\*;
- level of technology required;
- average duration of the analysis;
- global average price (in USD).

\*The definition of the classes of risk is available [here](#).

The above-listed indicators aim to provide laboratories with practical information to make sound decisions, whenever possible, on the adoption of the most sustainable method to determine a soil parameter among the potential ones.

To facilitate the discussion on the sustainability classes to be assigned to each of the SOPs harmonized by GLOSOLAN in 2021, an online survey was launched in the weeks before the meeting. Mr Benedetti presented the survey results that were used to open the discussion and ultimately get to a decision on the classes of risk to assign to each SOP (see Table 2.). Please note that participants were not asked to endorse the global average price of the analysis since price data will be validated and processed by GLOSOLAN, and ultimately endorsed by the RESOLANs.

Table 2. Sustainability of methods for the GLOSOLAN SOPs 2020-2021

Type of parameter	Parameter	Method	Risk for human health	Environmental risk	Level of technology required	Average duration of the analysis
<b>Physical</b>	Particle size-distribution	Hydrometer	Low	Low	Low	One working day
	Particle size-distribution	Pipette	Low	Low	Low	More than one working day

Type of parameter	Parameter	Method	Risk for human health	Environmental risk	Level of technology required	Average duration of the analysis
	Bulk density	Core method	Low	Low	Low	More than one working day
	Moisture content	Gravimetric method	Low	Low	Low	More than one working day
<b>Chemical</b>	Total carbon	Dumas dry combustion	Low	Low	Medium	Half working day
	Particulate organic carbon	Physical fractionation	Low	Low	Medium	More than one working day
	Particulate organic carbon	Walkley and Black	High	High	Medium	More than one working day
	Particulate organic carbon	Dumas	Low	Low	Medium	More than one working day
	Quasi-total elements (including total heavy metals)	Digestion using aqua regia and EPA	High	High	High	One working day
	Exchangeable bases and CEC	Ammonium acetate	Medium	Medium	High	More than one working day
	Available micronutrients (Fe, Zn, Cu, Mn, Mo, Ni, Cd)	Extraction using DTPA	Medium	Medium	High	More than one working day

Type of parameter	Parameter	Method	Risk for human health	Environmental risk	Level of technology required	Average duration of the analysis
	Boron	Hot water extraction	Medium	Medium	Medium/High (depending on the determination method)	One working day
	Macro and micronutrients (including S and B)	Mehlich III	Medium	Medium	High	One working day
<b>Biological</b>	Soil respiration rate	Trap and incubation + back-titration with HCl	Low	Low	Low	More than one working day
	Microbial biomass C and N	Chloroform fumigation-extraction	High	High	Medium/High (depending on the determination method)	More than one working day
	Microbial enzyme activities	Incubation and filtration	Medium/High (depending on the enzyme)	Medium	Medium	More than one working day

#### 4.4 GLOSOLAN SOPs 2021-2022

In order to facilitate the discussion that SOPs GLOSOLAN should harmonize in 2022, RESOLAN inputs and GSP technical networks requests were compiled in an online survey that was launched prior the meeting. From among the listed methods, GLOSOLAN members were asked to express five preferences for soil chemical parameters, two preferences for soil physical and two preferences for soil biological parameters. Ms Caon moderated the discussion that led to the following decision. In 2022, GLOSOLAN will harmonize the following SOPs:

- **soil chemical parameters**
  - available phosphorus by KCl : for AFRILAB to harmonize since this method is mostly used by laboratories in the region;
  - organic matter by loss of ignition;
  - exchangeable acidity by KCl 1M;
  - soil buffer capacity using KOH;
  - Fe and Al oxides by ammonium oxalate;
  - Fe and Al oxides by sodium citrate plus sodium dithionite.

The last two methods are complementary.

A working group will be established to prepare a matrix and ultimately make a decision on which method to harmonize in 2022 and which one to postpone to 2023 (even by launching an online survey among GLOSOLAN members).

Moreover, another proposal regarded the harmonization of the SOP on greenhouse gases (GHGs) emissions in soil. Still, not many laboratory perform this analysis, as it is mainly executed in the field and for research purposes. In addition to that, it was pointed out that it would be important to specify what gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) the SOP should target. As a conclusion, GLOSOLAN stressed the need for joint actions on the harmonization of field methodologies. Meeting participants decided that GLOSOLAN members may establish a working group that can join the experts from other GSP Pillars of Action to work together on the harmonization of field methodologies.

- **soil physical parameters**

- water retention (pF) curve;
- particle density by pycnometer.

- **soil biological parameters**

Participants agreed to work with NETSOB experts on the harmonization of SOPs for soil biological parameters. Together, they will discuss which SOPs to harmonize next year, taking into account the inputs received from the RESOLANs (nitrifying bacteria, microbial population identification, DNA extraction) and the needs of NETSOB (focus on micro-, meso- and macro-fauna).

#### 4.5 SOPs on other soil analysis-related topics and communication

Mr Benedetti presented a proposal by Ms. Hanane Aroui (IRD France/Senegal) and other members of the GLOSOLAN working group on laboratory health and safety, to develop SOPs on the topic. These would cover procedures for particular operations (e.g. reagents handling, fume detection, disposal of waste, etc.) by applying and adapting the same approach used to harmonize the SOPs for wet chemistry. This proposal derived from the need to produce more material dealing with specific aspects of laboratory health and safety, in addition to the activities implemented so far and documents already published (training sessions, posters, workshops). Participants endorsed this proposal and asked the working group on laboratory health and safety to identify the SOPs on the topic to harmonize. Mr Benedetti invited all experts interested in joining the working group to send an email to the GLOSOLAN coordinators.

Mr Benedetti recalled all the different soil parameters covered by the GLOSOLAN SOPs. These currently include wet chemistry, dry chemistry (soil spectroscopy), fertilizer analysis (through the work of INFA), and laboratory health and safety (soon). However, participants were invited to send any suggestion and request for additional SOPs to harmonize by email before the end of 2021.

While thanking network members that contributed to the translation of the GLOSOLAN SOPs and to the recording of training videos, Mr Benedetti invited all laboratories wishing to contribute to these activities to contact the network coordinators by email.

## 5. GLOSOLAN collaborations

### 5.1 GLOSOLAN-policy interactions

Mr Benedetti presented a [poster to participants](#) published by GLOSOLAN, to better inform them about the importance of soil analysis and the value of investing in soil laboratories. He also presented the results of a survey enquiring about RESOLAN main needs and about the relations between laboratories and the national and regional governments. The survey aimed to explore the awareness of institutions about the role played by soil laboratories in providing reliable data. Survey results showed that in around 80 percent of the cases (see Figure 3.) regional and national governments are somewhat aware about the importance of soil laboratories in producing good-quality soil data or even not aware at all. Therefore, laboratories expressed the need to produce more awareness raising material to better inform governments about their activities, and asked GLOSOLAN and RESOLANs to facilitate the communication between central governments and soil laboratories. In this regard, the request to write policy briefs on the role of soil laboratories was made. Ultimately, it was decided to write policy briefs on regional priorities that will be written by each RESOLAN under the coordination of the RESOLAN Chairs, vice-Chairs and Steering Committees. Lastly, the GLOSOLAN Technical Committee will review the documents before their publication.

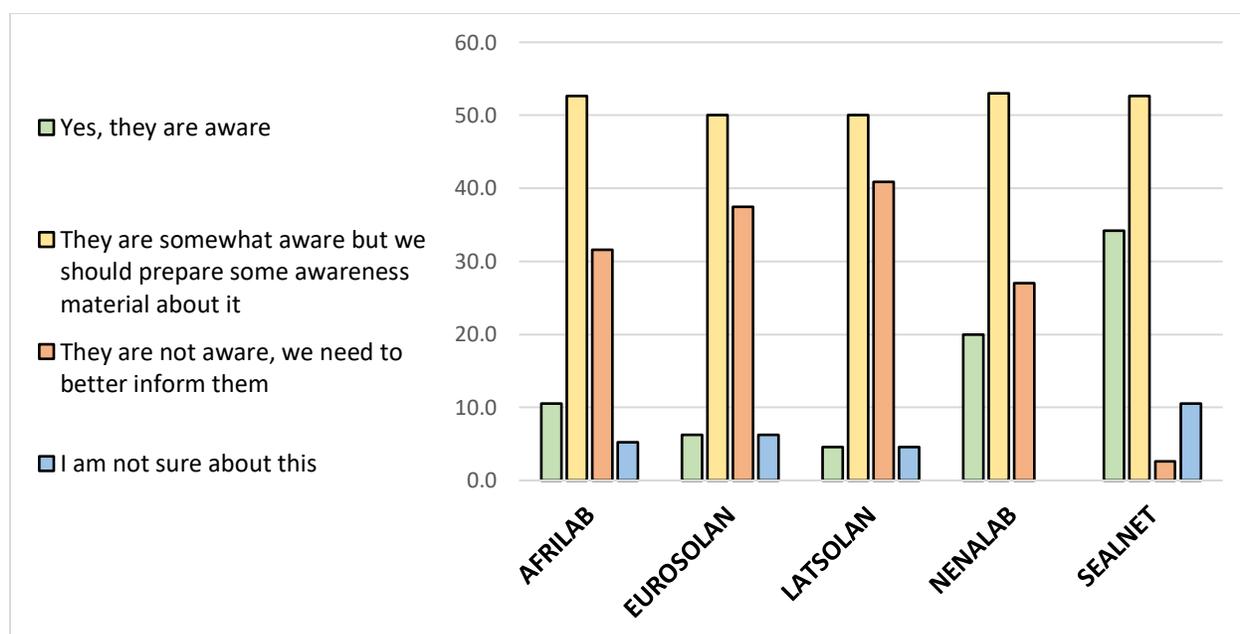


Figure 3. Feedback collected from the RESOLAN 2021 meetings about the awareness of regional and national governments about the importance of soil laboratories.

### 5.2 Collaboration with the International Network on Soil Information Institutions (INSII)

The collaboration between GLOSOLAN and INSII was discussed at the RESOLAN meetings and presented at the 7<sup>th</sup> INSII meeting by Ms Caon. Both INSII and GLOSOLAN recognized the added value of working together. On one hand, GLOSOLAN can support INSII in terms of provision of fresh measured, harmonized and good quality data (information on the uncertainty of the data). On the other hand, INSII can support GLOSOLAN in terms of; (i) development of an infrastructure for storing, serving and exchanging soil

laboratory information/spectral services (GLOSIS), (ii) implementing the harmonization of (lab) data using GLOSOLAN results, and (iii) capacity building on data processing, storing, mapping and modelling.

Ultimately, the networks agreed to cooperate as following:

1. get connected: GLOSOLAN members to learn about their country representative in INSII. INSII to learn about the laboratories registered in GLOSOLAN. Let's explore if national databases can be enriched
2. GLOSOLAN to be consulted when technical specifications for preparing global maps are written. GLOSOLAN can advise on soil parameters and methods of analysis. GLOSOLAN can help in getting transfer functions.
3. INSII to train GLOSOLAN laboratories on data processing, storage and management. How can laboratories organize their data? Link to National Soil Information Systems.
4. INSII and GLOSOLAN to work together on the writing of guidelines on soil sampling, storage and transportation

## 6. GLOSOLAN governance

### 6.1. Technical and Steering Committees

In 2020, the 4<sup>th</sup> GLOSOLAN meeting agreed to establish a Technical Committee to evaluate RESOLAN and GLOSOLAN members' requests and proposals for work, to recommend the SOPs to include in the annual GLOSOLAN work plan, and to advice on the writing of technical documents. Even though the Terms of Reference of the committee had to be endorsed at the 5<sup>th</sup> GLOSOLAN meeting, in 2021, 18 experts were invited to be part of the Technical Committee and to start working on:

- The review of the FAO Soils Bulletin 74: agree on how the revised FAO Soils Bulletin 74 should look like, identify the sections to revise, divide tasks (link to the establishment of working groups) and define the graphics to prepare.
- The writing of guidelines on the development of transfer functions: no progress on this. SOP working groups focused on this on personal initiative.

At the 5<sup>th</sup> GLOSOLAN meeting, the proposal to strengthen the governance of GLOSOLAN by establishing also a Steering Committee was made and endorsed. In this regard, the Terms of Reference of the GLOSOLAN Technical Committee were revised and the Terms of Reference of the GLOSOLAN Steering Committee were defined as in Annex IV. The organigram of the network is reported in Figure 4.

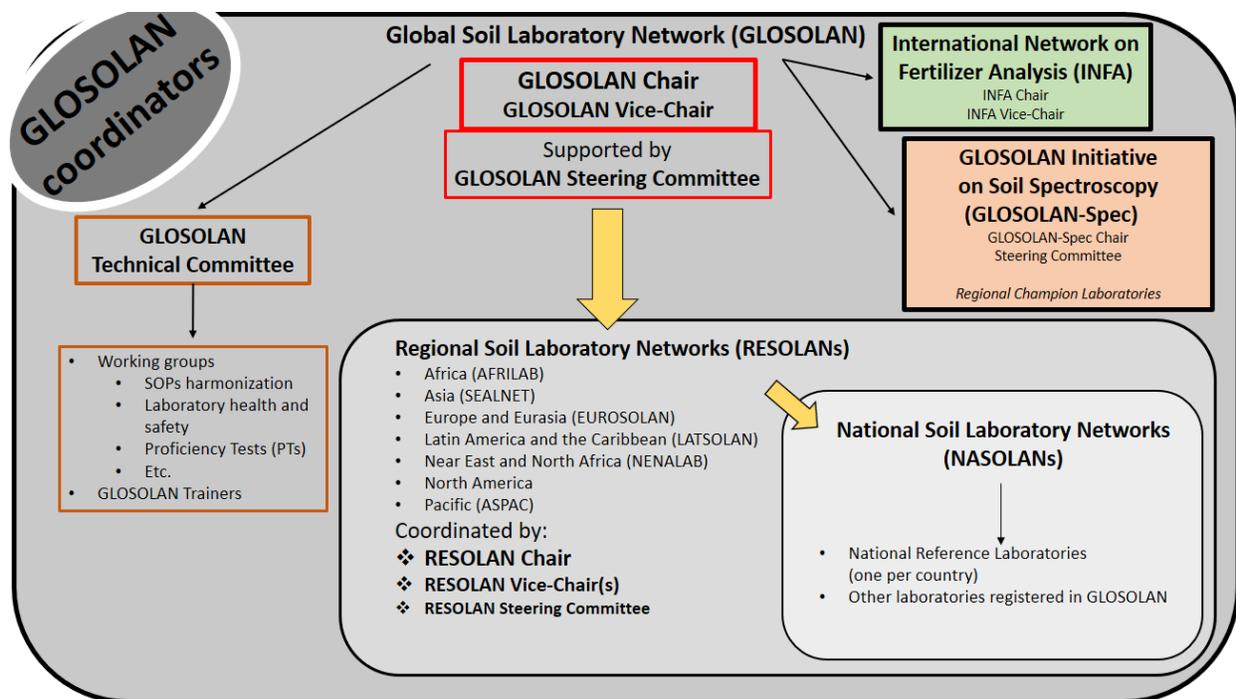


Figure 4. GLOSOLAN organigram

## 6.2 GLOSOLAN Chair and Vice-Chair

Ms Caon thanked Ms Nopmanee Suvannang from Thailand and Mr Rob de Hayr from Australia for their extraordinary support to the network as GLOSOLAN Chair and GLOSOLAN vice-Chair in 2019-2021. Ultimately, Ms Miriam Ostinelli from Argentina was elected GLOSOLAN Chair and Mr Elh Moudi Moustapha Abdourahaman from Niger was elected GLOSOLAN vice-Chair for the period 2021-2023. In order to better comply with her role of GLOSOLAN Chair and in order to avoid conflicts of interest, Ms Ostinelli will withdraw from her role as LATSOLAN Chair.

Background information on Ms Ostinelli are herewith reported:

- Researcher at the Soil Institute Laboratory. Since 1992.
- Professor - Cathedra of Soil Management and Conservation – Agronomic Engineering and Engineering in Agricultural Mechanization - Higher School of Engineering, Informatics and Agri-Food Sciences of the University of Moron. Since 2006.
- Coordinator of the Interlaboratory Controls Program of the INTA Network of Soil, Water and Vegetable Laboratories (RILSAV). 2006 - 2012.
- Member of the Coordinating Commission of the Agricultural Laboratories Methodological Support System - Ministry of Agriculture, Livestock and Fisheries of the Nation (MAGyP - Argentina). Since 2006.
- Institutional Quality Auditor (INTA) and Calibrator of the mass and volume magnitudes of the Aptitude, Standards and Metrology Testing Laboratory of INTA - LEAPMI. Accredited by the Argentine Accreditation Body (OAA). Since 2006.

- Member of the Scientific Committee of the Ibero-American Virtual Congress on Quality Management in Laboratories. Since 2007.
- Member, representing INTA, of the Soil Quality Committee of IRAM (Argentine Institute for Standardization and Certification). Since 2008.
- Member of the Coordinating Commission of the National Agricultural Soil Interlaboratory Program - (MAGyP - Argentina). Since 2009.
- Technical Expert of the Argentine Accreditation Body (OAA – Organismo Argentino de Acreditación) for Testing Laboratories. Since 2011.
- Coordinator of the Interlaboratory Controls and Reference Materials Module - PNSUELO Project - 1134034 "Development and implementation of analytical, instrumental and quality management methods in the Network of Soil, Water and Vegetable Laboratories (RILSAV)". 2013 - 2018
- Member, representing INTA, of the Network of Good Agricultural Practices (RED BPA). Commission "Fertilizers". Since 2018.
- Activities in LATSOLAN and GLOSOLAN. Since 2018

Background information on Mr Abdourahaman are herewith reported:

- INRAN (Institut National de la Recherche Agronomique du Niger). Researcher at LASEVE (Soil, water, crop and fertilizer Lab at CERRA (Centre Régional de la Recherche Agronomique) - Niamey. (i) soil conservation specialist, (ii) interpretation of soil analysis results and recommendations, (iii) soil management and land use planning, (iv) training delivery to technicians on new technologies and work safety in the Laboratory, (v) soil study and soil mapping, and (vi) management of Soil DOCs Kit (A kind of mobile laboratory). Since 2015
- Regional Crop Protection Laboratory of Zinder. Civil service. (i) treatments formulations and applications, (ii) adequate handling of chemicals, (iii) survey and early warning system, and (iv) training delivery to producers. 2010-2012
- Soil Science Lab Faculty of Agriculture Ahmadu Bello University. Industrial training involving practicing Routine analysis including pH, carbon, phosphorus, exchangeable bases, CEC. Under the supervision of the head of the laboratory. 2008

To note that Ms Ostinelli and Mr Abdourahaman were the only candidates for the position and presented themselves on November 23, 2021.

## 7. GLOSOLAN work plan 2022

In conclusion, the GLOSOLAN work plan for the year 2022 was revised and endorsed. This is reported in Table 3.

Table 3. GLOSOLAN work plan for 2022

Activity	Responsible party	Deadline
Organization of webinars on several topics, in several languages	GLOSOLAN Coordinators and trainers	December 2022
Translation of the GLOSOLAN website and publications in several languages	GLOSOLAN Coordinators and translators	December 2022
Update of SIMPLE	GLOSOLAN Coordinators with the support of GLOSOLAN members	December 2022
<b>Regional Soil Laboratory Networks (RESOLANs)</b>		
Organization of the meeting between RESOLAN Chair, vice-Chair(s) and Steering Committee <ul style="list-style-type: none"> <li>The GLOSOLAN coordinator to share information on RESOLAN members with the heads of each region</li> </ul>	GSP Secretariat	December-January 2021
Organization of the annual meetings of SEALNET, AFRILAB, LATSOLAN, EUROSOLAN, NENALAB and ASPAC (2 hours virtual meeting on decision making)	GSP Secretariat	June to September 2022
<b>National Reference Laboratories and National Soil Laboratory Networks (NASOLAN)</b>		
Update and create NASOLAN webpages as needed	GSP secretariat and National Reference Laboratories with the support of all GLOSOLAN members	Continuous
Monitor the performance of National Reference Laboratories	GLOSOLAN Coordinators, RESOLAN Chair, vice-Chair(s) and Steering Committee	Continuous
<b>GLOSOLAN PT</b>		
Publish the results of the GLOSOLAN PT 2021	GLOSOLAN Coordinator and PT experts	June 2022

Organize regional PTs (if possible)	RESOLANs and GLOSOLAN Coordinator	December 2022
Purchase equipment to good performing laboratories (see GLOSOLAN PT 2021 results) if the budget allows it.  <i>Note: financial resource constrains due to Covid-19</i>	GLOSOLAN Coordinator	December 2022 – 2023 (procurement is a long process)
<b>Standard Operating Procedures (SOPs)</b>		
Publish the SOPs harmonized in 2021	GLOSOLAN Coordinator	March 2022
Harmonize the SOPs for the methods agreed at the 5 <sup>th</sup> GLOSOLAN meeting, including SOPs on health and safety  Discuss how to harmonize, update or develop “special” methods with INBS, INSAS, NETSOB, and GLOSOLAN partners like Fields4Ever.	SOP working groups, Review Panels and other networks/partners	December 2022
Publish information on the sustainability of the methods harmonized in 2021 on the GLOSOLAN website	GLOSOLAN Coordinator	December 2021
Include reference values and range values to the GLOSOLAN SOPs harmonized so far and in those in the work plan 2021-22	SOP working groups (range values); working groups to be established with GSP Pillars of Actions and other Technical Networks (reference values).	December 2022
Contact with coordinators and Chairs of NETSOB, INBS and INSAS to invite external experts to join GLOSOLAN SOP working groups to review already-published SOPs and to decide which soil biological parameters to target in 2022.	GLOSOLAN Coordinator	December 2022
<b>Units of measure</b>		
Publish the units of measure endorsed at the 4th GLOSOLAN meeting and prepare conversion tables	Technical Committee and GLOSOLAN Coordinator	March 2022

<i>This activity was in the GLOSOLAN work plan 2021 but it was not implemented</i>		
<b>GLOSOLAN Technical Committee</b>		
Published the TORs for the position on the GLOSOLAN website and inform GLOSOLAN members on the members of the Committee	GLOSOLAN Coordinator	December 2021
Organization of regular meetings	GLOSOLAN Coordinator	Continuous
Prepare a quick-reference guide to building a transfer function for harmonization.  <i>This activity was in the GLOSOLAN work plan 2021 but it was not implemented</i>	Technical Committee	December 2022
Develop a plan on how to update the FAO Bulletin 74:  <ul style="list-style-type: none"> <li>• No rewriting of the document from scratch but only UPDATING information</li> <li>• The use of English should be simple with short sentences (everyone should be able to understand the document easily and quickly). This will greatly help translators as well</li> <li>• The document should be downloadable. Can be divided into chapters that can be downloaded as separate documents</li> <li>• The document should include visuals (use of images and graphics that make the document easier to understand)</li> <li>• Some items in the Table of Content have already been addressed by GLOSOLAN</li> </ul> Identify sections that need to be updated and those whose information is still valid  Identify the lead authors. (If possible) the original authors of the Bulletin should be involved	Technical Committee and experts on specific topics as needed  GSP Secretariat to support with layout and graphic elements	December 2022

Publish the FAO Bulletin 74 on the GLOSOLAN webpage	GLOSOLAN Coordinator	December 2022
Write a policy brief on the importance of soil laboratories and soil analysis. Link to waste management and policy support to laboratories	To be discussed by RESOLANs. GLOSOLAN Technical Committee to review RESOLAN proposals. Eventually, RESOLAN working groups to write the documents	December 2022
<b>GLOSOLAN Steering Committee</b>		
Establish the Steering Committee and publish the TORs for the position on the GLOSOLAN website	GLOSOLAN Coordinator	December 2021
Organization of regular meetings	GLOSOLAN Coordinator	Continuous
Review the GLOSOLAN work plan in the long-term	Steering Committee and GLOSOLAN Coordinators	March 2022
Develop a policy strategy to support laboratories on e.g. lab maintenance, waste management, etc.	Steering Committee and GLOSOLAN Coordinators	July 2022
Comply with their task as needed	Steering Committee	December 2022
<b>GLOSOLAN-INSII collaboration</b>		
INSII and GLOSOLAN to share contact information	INSII and GLOSOLAN Coordinators	February 2022
Writing of guidelines on soil sampling, storage and transportation	INSII and GLOSOLAN experts	December 2022
INSII to organize trainings on data management and storage to GLOSOLAN	INSII trainers	December 2022

## Annex I. Agenda



### **Fifth meeting of the Global Soil Laboratory Network (GLOSOLAN)**

23 - 25 November 2021

from 11:00 AM to 2:00 PM GMT +1

*Online meeting – Zoom platform*

Tuesday, 23 November 2021		
11:00-11:10 AM GMT+1	Opening	Mr. Ronald Vargas, GSP Secretary, FAO  Ms. Nopmanee Suvannang, GLOSOLAN Chair
11:10-11:15 AM GMT+1	Endorsement of the Agenda and group picture	Ms. Lucrezia Caon, GLOSOLAN coordinator, FAO
11:15-11:50 AM GMT+1	<b>Item 1:</b> Report of the work performed by GLOSOLAN in 2020-2021:  - GLOSOLAN SOPs - Global PT 2021 - Training videos - Webinars	Ms. Nopmanee Suvannang, GLOSOLAN Chair
11:50-12:10 PM GMT+1	<b>Item 2:</b> 2020-2021 report of the GLOSOLAN Initiative on Soil Spectroscopy (GLOSOLAN-Spec)	Mr. Eyal ben Dor, GLOSOLAN- Spec Chair
12:10-12:30 PM GMT+1	<b>Item 3:</b> 2020-2021 report of the International Network on Fertilizer Analysis (INFA)	Dr Wesley Karl Feldmann, INFA Chair
<b>Regional Soil Laboratory Networks (RESOLANs)</b>		
12:20 – 1:20 PM GMT+1	<b>Item 4:</b> Regional priorities and needs, and presentation of progresses on the establishment of NASOLANs  <ul style="list-style-type: none"> <li>● Asian Soil Laboratory Network (SEALNET) by <i>Ms. Gina Nilo, SEALNET Chair (5')</i></li> <li>● Latin American Soil Laboratory Network (LATSOLAN) by <i>Ms. Miriam Ostinelli, LATSOLAN Chair (5')</i></li> <li>● African Soil Laboratory Network (AFRILAB) by <i>Ms. Lesego Mooketsi-Selepe, AFRILAB Chair (5')</i></li> <li>● European and Eurasian Soil Laboratory Network (EUROSOLAN) by <i>Ms. Marija Romić, EUROSOLAN Chair (5')</i></li> </ul>	Moderator: Mr. Filippo Benedetti, Alternate GLOSOLAN Coordinator, FAO

	<ul style="list-style-type: none"> <li>• Near East and North African Soil Laboratory Network (NENALAB) by <i>Mr. Abdelmjid Zouahri, NENALAB Chair (5')</i></li> <li>• Pacific Soil Laboratory Network (ASPAC) by <i>Mr. Rob de Hayr, ASPAC facilitator (5')</i></li> <li>• North America by <i>Mr. Christopher Lee, KSSL-USDA (5')</i></li> </ul> <p>Reflection on the need to organize national and regional proficiency tests (PTs)</p> <p><i>Mr. Christian Hartmann, IRD France</i></p>	
1:20 – 1:50 PM GMT+1	<p><b>Item 5:</b> Review and endorsement of the terms of reference for the position of RESOLAN Chair, RESOLAN vice-Chair and RESOLAN Steering Committee.</p> <p>Presentation of the new RESOLANs governance</p>	Lucrezia Caon, GLOSOLAN Coordinator, FAO
1:50 - 2:00 PM GMT+1	<p>Presentation of the candidates for the position of GLOSOLAN Chair and vice-Chair 2021-2023</p> <p>Closure of the day</p>	

Wednesday, 24 November 2021

Standard Operating Procedures

11:00-11:50AM GMT+1	<p><b>Item 6:</b> Open discussion on how to harmonize those methods that are little used or for which we have few experts in the working groups.</p> <ul style="list-style-type: none"><li>- Presentation of RESOLAN's opinions on the topic</li><li>- Collaboration with other networks:<ul style="list-style-type: none"><li>o International Network on Soil Biodiversity (5') by Ms. Rosa Cuevas, GSP/FAO</li><li>o International Network on Black Soils (5') by Mr. Yuxin Tong, GSP/FAO</li><li>o International Network on Salt-Affected Soils (5') by Ms. Maria Konyushkova, GSP/FAO</li></ul></li></ul>	Moderator: Ms. Lucrezia Caon, GLOSOLAN Coordinator, FAO
11:50-12:20 PM GMT+1	<p><b>Item 7:</b> Inclusion of range values and reference values in the GLOSOLAN SOPs</p> <ul style="list-style-type: none"><li>- Presentation of RESOLAN's opinions on the topic</li><li>- Open discussion</li></ul>	Ms. Miriam Ostinelli, LATSOLAN Chair
12:20- 12:40 PM GMT+1	<p><b>Item 8:</b> Endorsement of the sustainability of the methods harmonized in 2020-2021</p> <ul style="list-style-type: none"><li>- Presentation of survey results</li></ul>	Mr. Filippo Benedetti, Alternate GLOSOLAN Coordinator, FAO
12:40-1:30 PM GMT+1	<p><b>Item 9:</b> Decision on the SOPs to harmonize in 2021-2022</p> <ul style="list-style-type: none"><li>- Recap on the SOPs harmonized and under preparation</li><li>- Presentation of survey results</li><li>- Open discussion</li></ul>	Ms. Lucrezia Caon, GLOSOLAN Coordinator, FAO

1:30 – 2:00 PM GMT+1	<p><b>Item 10:</b> Other SOPs and related communication material</p> <ul style="list-style-type: none"> <li>- SOPs on health and safety</li> <li>- Other SOPs to develop?</li> <li>- Video training recording: guidelines and work plan</li> <li>- Upcoming webinars</li> </ul>	<p>Ms. Hanane Aroui, IRD</p> <p>Mr. Filippo Benedetti, Alternate GLOSOLAN Coordinator, FAO</p>
2:00 PM GMT+1	Closure of the day	

Thursday, 25 November 2021		
Policy and collaborations		
11:00-11:45 AM GMT+1	<p><b>Item 11:</b> GLOSOLAN's value chain and discussion on GLOSOLAN-policy interactions</p> <ul style="list-style-type: none"> <li>- Development of a policy strategy to support laboratories on e.g. lab maintenance, waste management, etc.: writing of a policy brief?</li> </ul>	<p>Mr. Filippo Benedetti, Alternate GLOSOLAN Coordinator, FAO</p>
11:30 – 12:00 PM GMT+1	<p><b>Item 12:</b> collaboration between GLOSOLAN and the International Network on Soil Information Institutions (INSII) : addressing data quality in maps production</p> <ul style="list-style-type: none"> <li>- Presentation of RESOLAN's opinion on the topic</li> <li>- Open discussion</li> </ul>	<p>Mr. Lucrezia Caon, GLOSOLAN Coordinator, FAO</p> <p>Mr. Yusuf Yigini, GSP/FAO</p>
Technical Committee and other bodies		
12:00-12:30 PM GMT+1	<p><b>Item 13:</b> Progresses, needs and way forward</p>	<p>Mr. Filippo Benedetti, Alternate GLOSOLAN Coordinator, FAO</p>

	<ul style="list-style-type: none"> <li>- Endorsement of the Terms of Reference of the Technical Committee</li> <li>- Presentation of the current members of the Technical Committee</li> <li>- Updates on the review of the FAO Soils Bulletin 74 – “Guidelines for Quality Management in Soil and Plant Laboratories” - (<a href="http://www.fao.org/3/W7295E/W7295E00.htm">http://www.fao.org/3/W7295E/W7295E00.htm</a>)</li> <li>- Updates on the writing of guidelines on the development of transfer functions</li> </ul>	
12:30-1:00 PM GMT+1	<b>Item 14:</b> Discussion on the establishment of a Steering Committee in GLOSOLAN. Presentation of the Terms of Reference.	Mr. Lucrezia Caon, GLOSOLAN Coordinator, FAO
1:00 – 1:15 PM GMT+1	<b>Item 15:</b> Election of the new GLOSOLAN Chair and vice-Chair	Ms. LMr. Lucrezia Caon, GLOSOLAN Coordinator, FAO
1:15 - 1:45 PM GMT+1	<b>Item 16:</b> Endorsement of the GLOSOLAN work plan and decisions for the year 2022.	
1:45 - 2:00 PM GMT+1	Greetings from the former GLOSOLAN Chair and vice-Chair Closure of the meeting	

## Annex II. List of participants

### From the Global Soil Partnership, FAO:

Ms Lucrezia Caon, GLOSOLAN Coordinator

Mr Filippo Benedetti, GLOSOLAN Alternate coordinator

Mr Yi Peng, coordinator of GLOSOLAN-Spec

Mr Ronald Vargas, GSP Secretary

Ms Rosa Cuevas, coordinator of the International Network on Soil Biodiversity (NETSOB)

Ms Maria Konyushkova, coordinator of the International Network on Salt-Affected Soils (INSAS)

Mr Yuxin Tong, coordinator of the International Network on Black Soils (INBS)

Mr Yusuf Yigini, coordinator of the International Network on Soil Information Institutions (INSII)

Ms Vinisa Saynes Santillán, coordinator of the International Network on Fertilizer Analysis (INFA)

Ms Carolina Olivera, GSP Secretariat

Country	First Name	Last Name	Name of laboratory
Albania	Romina	Baku	Soil laboratory of technology transfer center Fushe-Kruje
Algeria	Asma	Belouanas	Algérie
Algeria	Salima	Benouadah	Laboratory of Ago Biotechnology and Nutrition in Semi Arid Zones, Tiaret
Argentina	Nanci	Kloster	RILSAV-EEA Anguil
Argentina	Maria Natalia	Barnasthpol	Laboratorio de Análisis Químico de Suelo, Agua y Vegetal, INTA, EEA Cerro Azul, Misiones
Argentina	Daniel	Carreira	Laboratorio del Instituto de Suelos (LabIS) INTA
Argentina	Miriam Mabel	Ostinelli	Laboratorio del Instituto de Suelos - INTA
Argentina	Bárbara Eloísa	Iwasita	INTA EEA Cerro Azul Laboratorio Suelo Agua y Vegetal
Australia	Robert	De Hayr	ASPAC

Australia	Fred	Oudyn	DES - Chemistry Centre
Australia	Graham	Lancaster	Graham Lancaster
Australia	DES	Centre	DES Chemistry Centre
Australia	Wei	Zhang	Wei Zhang
Austria	Wolfgang	Friesl-Hanl	Environmental Agency Austria
Bangladesh	Zainal	Abedin	Central Laboratory, Soil Resource Development Institute
Bangladesh	Shamim Al	Mamun	Soil and Organic Waste Management Laboratory
Bangladesh	Md.	Islam	Soil Fertility and Plant Nutrition Laboratory
Belgium	Benjamin	Guillaume	University of Liège - Gembloux Agro-Bio Tech - Water, Soil & Plant Exchanges
Belgium	Aurore	Degre	ULiège Gembloux Agro-Bio Tech
Belgium	Stefaan	De Neve	Soil Fertility and Nutrient Management
Belgium	Clémence	Mariage	ULiège GxABT Axe Echanges Eau-Sol-Plante
Benin	Tobi Moriaque	Akplo	University of Abomey-Calavi
Bhutan	Jamyang	Jamyang	Soil & Plant Analytical Laboratory
Botswana	Gaofengwe	Ntoko	BETACH LABORATORY-BOTSWANA
Botswana	Lesego	Mooketsi-Selepe	Soil and Plant Analytical Laboratory
Brazil	Daniel	Perez	LASP/Embrapa
Cambodia	Sambo	Pheap	Soil Science Laboratory
Cambodia	Pinnara	Ket	ITC soil laboratory
Cameroon	Mfopou Mewouo	Yvette Clarisse	Laboratoire d'analyses des sols, plantes eaux et Engrais
Cameroon	Rose	Ndango	International Institute of Tropical Agriculture - IITA

Cameroon	Armelle	YOUTH A	National Laboratory of soil , plant , water and fertilizers Analysis- IRAD
Cameroon	Bertrand	Zing Zing	LASPEE
Cameroon	Edouard	NYA	National Laboratory for Analysis of Agricultural Inputs and Products
Cameroon	Aline Beatrice	Nzeket	LASPEE IRAD
Chile	Humberto	Aponte	Laboratory of Soil Microbial Ecology and Biogeochemistry (LEMiBiS)
China	Keren	Wu	soil group
Colombia	Rosalina	Gonzalez Forero	La Salle University Soil Laboratory
Colombia	Jessica	Rodriguez Escobar	Biotec
Colombia	Gerardo	Ojeda	Universidad Nacional Abierta y a Distancia UNAD
Colombia	Luisa	Becerra	Biotec
Costa Rica	Floria	Bertsch	LATSOLAN Board, LSF/CIA- Universidad de Costa Rica
Costa Rica	Carlos	Henríquez	Laboratorio de Suelos y Foliare s CIA / Universidad de Costa Rica
Croatia	Goran	Stuhne	EUROFINS CROATIAKONTROLA d.o.o.
Croatia	Marija	Romic	Marija Romic
Cuba	Milagros Lisandra	Quintana Miranda	Laboratorio de Suelo, agua y Tejido Vegetal
Cuba	Daily	Hernandez Garcia	Laboratorio de Suelo, Agua y tejido Vegetal
Cuba	Ramón	Blanco	Laboratorio suelos INICA, AZCUBA
Cuba	Olivia De Lourdes	Rosales Torres	Laboratorio de Suelo, Agua y Tjido Vegetal
Czechia	Jiří	Čuhel	Central Institute for Supervising and Testing in Agriculture
Democratic Republic of Congo	Joel	Tungi Tungi	OSFAC

Denmark	Nicolai	Bork	Foss
Djibouti	Mohamed	Egueh Walieh	Laboratoire de Pédologie
Djibouti	Sougueh	Cheik	Pedology Lab, CERD
Dominican Republic	Teófilo	Záiter	Dominican Agribussines Laboratory
Dominican Republic	María	Suarez	República Dominicana
Dominican Republic	Ramon Esteban	Fernandez Guillen	Lab, Junta Agroempresarial Dominicana
Ecuador	Betty	Rivadeneira Moreira	Laboratorio Suelos y Aguas EETP- INIAP
Ecuador	Katty	Pastás	Laboratorio de Suelos, Foliare y Aguas-Agencia de Regulación y Control Fito y Zoon sanitario
Egypt	Ahmed	El Baroudy	Soil, Water and Plant analysis Laboratory
Egypt	Abd El-Hamid Elghadban Abd El-Lattif	Sherif	Dr.Abd El-Hamid Elghadban Abd El-Lattif
Egypt	Sayed	Eltohamy	soil, water and environmental
El Salvador	Nidia	De Landaverde	Laboratorio de FUSADES
Ethiopia	Musefa Redi	Abegaz	Holeta Agricultural Research Center Soil Laboratory
Ethiopia	Mulugeta Aytnew	Ferede	BDU
Fiji	Deeksha	Krishna	CAFF soil lab
France	Cecile	Gomez	LISAH
Gabon	Neil-Yohan	Musadji	Laboratoire d'Analyses des Sols et Environnement
Gabon	Rolf Mabicka Obame- Lase- Gabon		Laboratoire d'Analyses des Sols et Environnement
Georgia	Giorgi	Ghambashidze	Laboratory of Soil Fertility Research Service
Germany	Wanderson	Mendes	Soil Landscape Spectral Lab

Germany	Gsp	Cardoso Lisboa	GSP
Germany	Arne	Heidkamp	Thuenen-Laboratory of soil monitoring
Germany	Martin	Luft	Bruker
Ghana	Prosper	Amenuvor	CSIR-SARI Environmental Analytical Laboratory
Ghana	Bright Fafali	Dogbey	CSIR-Soil Research Institute, Kwadaso-Kumasi
Guam	Mohammad H.	Golabi	University of Guam Soil Labs
Guinea	Moussa Tady	Diallo	SENASOL
Haiti	Donald	Joseph	Laboratoire National de Sols
Hungary	Ágnes	Nagy	Food Chain Safety Centre Non-profit Ltd., Soil Conservation Laboratory, Velence
Hungary	Mohammed	Mohammedzein	Soil Science Department, Hungarian University of Agriculture and Life sciences
India	Subhabrata	Panda	AICRP on Agroforestry, BCKV, Jhargram, West Bengal, India
India	Pushpajeet	Choudhari	India
India	Kandula	Naga Madhuri	Soil-Plant-Manure-Water Analysis laboratory
India	Monoranjan	Mohanty	ICAR-Indian Institute of Soil Science, Bhopal
India	Sreenivas	Ch	ANGRAU, Maruteru
India	Priya	Gurav	IISS
India	Pradip	Dey	AICRP (STCR), ICAR-IISS
India	Nishant	Sinha	ICAR-IISS
Iran	Seyed Hashem	Khadem	iranian
Iran	Taher	Ahmadzadeh	KIMIA AB environmental and agricultural consulting laboratory
Iran	Syed	Cheraghi	Parham Gostar

Iran	Karim	Shahbazi	SWRI-Lab
Iran	Mojgan	Yeganeh	Soil and Water Research Institute
Iraq	Basim	AL-Obaidi	Soil chemistry
Iraq	Saadi Mahdi	Al-Ghraiiri	Soil fertility and fertilizers
Iraq	Saifuldeen	Salim	Center of Desert Studies
Israel	Eyal	Ben Dor	tau
Italy	Ialina	Vinci	ARPAV-DRL
Italy	Lidia	Vicentini	ersa - agenzia regionale per lo sviluppo rurale
Jamaica	Pamella	Mckenzie	PAMELLA Esmie MCKENZIE
Japan	Masaharu	Murakami	Soil Environment
Japan	Yuji	Maejima	Soil Inventory and Management Group, NIAES
Jordan	Isra`A	Al-Kharabsheh	soil and water laboratories
Kazakhstan	Maira	Kussainova	Natural Resources Management and Sustainable Development of Agroecosystems
Kosovo	Valmire	Havolli	KIA
Kuwait	Kisr Soil Laboratory	Analysts	soil chemistry
Latvia	Aldis	Butlers	Laboratory of Forest Environment
Latvia	Lauris	Leitāns	Satate Plant Protection Service Agrochemical Laboratory
Lebanon	Yara	Khairallah	LARI
Lebanon	Dany	Romanos	LARI
Lebanon	Isam	Bashour	Isam Bashour
Lebanon	Valérie	Azzi	Lebanese Agriculture Research Institute
Lesotho	Teboho	Lekoala	Department of Agricultural Research Lesotho
Malawi	Wesley	Feldmann	AgriLab Malawi

Malaysia	Sumathy	Rajendran	Laboratory Service Division, Department of Agriculture Malaysia
Malaysia	Nur Azarina	Abu Bakar	Soil Laboratory Department Of Agriculture
Malaysia	Atikah	Ali	Atikah Binti Ali
Mali	Karamoko	Sanogo	LOSSA
Mauritania	Cheikh	Ahmed El Moctar	Laboratoire de Pédologie
Mexico	Rosa	Martínez	Laboratorio de suelo, agua y planta
Mexico	Hector	Estrada-Medina	LABORATORIO DE ANALISIS DE SUELOS PLANTAS Y AGUA
Mexico	Karla	Tapia	LAQSAP INECOL
Mexico	Juliana	Padilla	Laboratorio de Fertilidad de Suelos y Química Ambiental
Mexico	Vinisa	Saynes Santillán	FAO
Mexico	Silvia Guadalupe	Ramos Hernández	Laboratorio de Ciencias de la Tierra y Medio Ambiente
Mexico	Agustín	García	Fertilidad de Suelos S. de R.L.
Mexico	Beatriz	Marín	LAQSAP
Mexico	Juan	Alemán	Quimialab
Mexico	Hilda	Rivas	LASA
Mexico	José Manuel	Cena Velázquez	LabSueP-FCA
Mexico	Alejandrina	Ruíz-Bello	Laboratorio de Física de Suelos
Mexico	Sandra	Rocha	LABSAP
Moldova	Alexandru	Purice	Biolab Test SRL
Mongolia	Dulamsuren	Byambasuren	soil and water laboratory of The Specialized inspection at Selenge aimak
Mongolia	Zoljargal	Khavtgai	Soil laboratory Institute of Geography and Geoecology, MAS
Mongolia	Nyamdavaa	Batsaikhan	Laboratory of Soil Sciences and Education

Morocco	Laila	Tajeddine	CESFRA SSL
Morocco	Khalid	Benzhir	Laboratoire d'Analyse de sol et plante d'Al Hoceima
Morocco	Mohamed	Elaissi	Biodevas Maroc
Morocco	Hana	Nabil	Pedology Laboratory(DSEB:LP)
Morocco	Karima	Bouhafa	Karima BOUHABA
Morocco	Abdelmijid	Zouahri	soil, water and plant analysis laboratory
Morocco	Cesfra Soil	Laboratory	CESFRA Soil Spectroscopy Laboratory
Myanmar	Ei		Soil and plant analysis laboratory
Myanmar	Ni	Tint	Soil and Plant Analysis Laboratory
Myanmar	Mya Mya	Swe	Soil and Plant Analysis Laboratory
Myanmar	Phyoe Phyoe	Win	Soil and plant analysis laboratory
Myanmar	Aung Kyaw	Thu	Irrigation Water Quality Analysis Laboratory
Myanmar	Cho	Htwe	Land Use Laboratory
Namibia	Ella	Shiningaymwe	Namibia, Agricultural Lab
Nepal	Rabindra	Adhikari	Laboratory of Soil Science and Geology, IOFPC
Netherlands	Fenny	Van Egmond	ISRIC / WENR
Netherlands	Winnie	Van Vark	Wageningen University
Netherlands	Titia	Mulder	Soil Geography and Landscape group, Wageningen University
Netherlands	Agrocares Golden	Laboratory	AgroCares Golden Standard laboratory
New Zealand	Sujatha	Senanayake	Environmental Chemistry laboratory
Nicaragua	Pedro	Muñoz	Laboratorio de suelos y agua comandante Fidel Castro Ruz
Nigeria	Abdourahaman Elh Moudi	Moustapha	LASEVE (Laboratoire de Sol Eau Engrais et Vegetaux

Nigeria	Ibitoye	Abolarin	Soil science Laboratory FUTA Akure Ondo State
Nigeria	Adedoyin	Adepoju	Efugo Extractive
Nigeria	Williams	Egbe	National Fertilizer, Soil and water reference laboratories, km 2 Kaduna- Abuja Exp.way, Goningora, Kaduna.
Nigeria	Toure	Youssouf	University of Ibadan
Nigeria	Suleiman	Garba	Phosphorus
Nigeria	Oluremi	Olalekan	Institute of agricultural research and training moor Plantation Ibadan
Oman	Hamood	Al-Hashmi	Soil & Water Laboratory
Oman	Saud	Al Farsi	Oman soil lab
Pakistan	Muhammad Faheem	Shahid	FFC Soil and water testing lab
Pakistan	Muhammad	Safdar	Soil Mechanics
Pakistan	Oshaq	Ali	Dept of soil science Sindh agriculture University tando jam
Pakistan	Haroon	Shahzad	AZRC DI KHAN
Pakistan	Muhammad	Saleem	Laboratory of Crop Plants and Soil Analysis, Department of Agronomy, Sindh Agriculture University, Subcampus, Umerkot, Pakistan
Pakistan	Sajjad Ali	Shah	Soil sciences
Pakistan	Muhammad	Humza	FFC Soil and Water Testing Labs
Pakistan	Khalilullah	Soomro	Plant Mol Pathology
Pakistan	Raza	Khan	Soil & Plant Nutrients Lab.
Pakistan	Muhammad Abbas	Aziz	Fauji Fertilizer Company Limited
Pakistan	Muhammad	Irshad	FFC
Pakistan	Kaleemullah	Kobhar	Soil test
Pakistan	Abdul Jabbar Hashmi		Farm Advisory Centre, FFC, Sheikhupura

Palestine	Nahawand Souqia		Nablus central laboratory
Palestine	Helana	Derbashi	Cenntal Nablus Laboratory
Papua New Guinea	Janet	Lipai	NARI Chemistry Laboratory
Papua New Guinea	Tata	Telawika	Unitech Analytical Services Laboratory
Paraguay	Patricia	Rojas	laboratorio de suelos FIA UNE
Peru	Fredy Fernando	Rivas Yupanqui	Laboratorio de Microbiología de suelos
Peru	Giuliana Shelly	Lizana Flores	Laboratorio de Microbiología de suelos
Peru	Juan Miguel	Guerrero Lázaro	Laboratorio de Análisis de Suelos, Plantas, Aguas y Fertilizantes (LASPAF)
Philippines	Nora	Talain	DA-Regional Soils Laboratory
Philippines	Ray Alvin	Mariscal	DA7 Regional Soils Laboratory
Philippines	Diana Rica	Godez	DA RSL 4A
Philippines	Sheila Mae	Bautista	Bureau of Soils and Water Management-Laboratory Services Division
Philippines	Chino Manuel	Antonio	Bureau of Soils and Water Management
Philippines	Rosalie	Laxamana	Regional Soils Laboratory - Department of Agriculture RFO III
Philippines	Emma	Tayad	Regional Soils Laboratory
Philippines	Ma Aussielita	Lit	ASTS
Philippines	Maria Pauline Joy	Danao	DA-RFO2-ISL
Philippines	Carleen	Calimpon	Department of Agriculture RFO VII
Philippines	Christine Joy	Aguinaldo	D.A RFO2 ILAGAN SOIL LAB
Philippines	Cristel Andrea	Gardoce	PhilRice- Agronomy Soils and Plant Physiology Laboratory

Philippines	Sheila	Quilang	Department of Agriculture RFO2-Ilagan Soil Laboratory
Philippines	Jay Mark	Tingcang	DA-RSL9
Philippines	Marjorie Jean	Tao	Bureau of Soils and Water Management
Philippines	Annabel	Sindayen	Regional Soils Laboratory RFO 9, ZC
Philippines	Olivyn	Angeles	IRRI
Philippines	Maria Carmela	Capule	CRL Environmental Corporation
Philippines	Aurora	Manalang	Bswm laboratory services division
Philippines	Mary Elizabeth	Banda	Regional Soils Laboratory-5
Philippines	Marife	Rebalde	Regionals Soils Laboratory
Philippines	Purisima	Juico	Dep't of Soil Science Soil and Plant Tissue Lab. (DSSSPTL)
Philippines	Ryan Jhoel	Pelagio	DA RSL 4A
Philippines	Marilyn	Gonzales	DA RSL 4A
Philippines	Ezra Mae	Gamboa	BSWM-Laboratory Services Division
Philippines	Kate Hyacinth	Ubiña	DA-RF02-ILD-Ilagan Soils Laboratory
Philippines	Allan Jay	Reynon	CVIAL-RSL
Philippines	Joerdette	Jimenez	Bureau of Soils and Water Management
Philippines	Bryan	Katigbak	Regionals Soils Laboratory 4A
Philippines	Rikko Jeremy	Pedroza	Department of Agriculture-Regional Soils Laboratory 9
Philippines	Christopher Ian	Bahinting	Regional Soils Laboratory 9
Philippines	Paralyn	Sana	Regional Soils Laboratory IX
Philippines	Lydia	Dologuin	REGIONAL SOILS LABORATORY
Philippines	Bergil	Bernaldo	Bureau of Soils and Water Management - Laboratory Services Division
Philippines	Edwin Glen	Nauí	ILD reg2

Philippines	Bibiana	De Torres	DA RSL 4A
Philippines	Annie	Espiritu	PhilRice-Agronomy Soils and Plant Physiology Laboratory
Philippines	Emelito	Ersando	DA RSL 4A
Philippines	Leah Fe	Briones	Department of Agriculture - Regional Soils Laboratory 9
Philippines	Nouri Ariadni	Mamalo	Office of the Provincial Agriculturist - Provincial Soils and Water Laboratory, Sultan Kudarat, Philippines
Philippines	Jamie Ann	Tumolva	Bureau of Soils and Water Management
Philippines	Beatriz	Magno	Bureau of Soils and Water Management
Philippines	Elly Paul	Tomas	Regional Soils Laboratory 12
Philippines	Rhodielyn	Bacsarpa	Regional Soils Laboratory
Philippines	Ira	Floro	Philippines
Philippines	Morena	Arnigo	DA RSL 4A
Philippines	Mabelle	Oblianda	DA RSL 4A
Philippines	Maria Gladys	Ersando	DA RSL 4A
Philippines	Agnes	Morada	Lab.serv.div./BSWM-D.A Phils.
Philippines	Gina	Nilo	BSWM LSD
Philippines	Rainear	Mendez	Soil and Plant Analysis Laboratory
Philippines	Maria Gemma	Genaldo	DA- Regional Soils Laboratory -9
Philippines	Maria Geneva	Depra	DA-XI-Regional Soils Laboratory
Philippines	Normindra	Sarawi	DA-Regional Soils Laboratory IX
Philippines	Shirley	Buduan	Bureau of Soils and Water Mgt.
Philippines	Nelsie Grace	Gela	Agro-Based Laboratory
Philippines	Fennelyn	Arciaga	DA RSL 4A
Philippines	Pio	Ollorsa	DA RSL 4A

Philippines	Majeth	Pescador	Ilagan Soils Laboratory
Philippines	Liwayway	Honrade	DA RSL 4A
Philippines	Shermark	Navarro	DA RSL 4A
Philippines	Michael Raymond	De Jesus	Regional Soils Laboratory DA RFO MIMAROPA
Philippines	Gerame	Calapre	Department of Agriculture RFO VII - Regional Soils Laboratory
Philippines	Jon Klyde	Mayol	Regional Soils Laboratory IX
Philippines	Ma.Salome	Montalban	Department of Agriculture - Regional Soils Laboratory IX
Philippines	Kris	Tolentino	DA RSL 8
Philippines	Evangeline	Valdez	F.A.S.T. Laboratories-Cubao
Portugal	Raquel Macedo Soveral	Mano	INIAV/SAFSV/LQARS
Portugal	João	Coutinho	Lab Solos - UTAD
Republic of Moldova	Serghei	Corcimaru	Soil Microbiology
Republica Dominicana	Emilio	Martinez	Laboratorio Agroempresarial Dominicano
Russian Federation	Elena	Shamrikova	Ecoanalit
Russian Federation	Konyushkova	Maria	FAO
Russian Federation	Olga	Yakimenko	Lomonosov Moscow State University
Senegal	Anna	Ndiaye	Ceres locustox
Senegal	Lamine Boubacar	Konate	Itna/Ucad
Senegal	Patricia	Moulin	LAMA IMAGO IRD Dakar
Slovenia	Špela	Velikonja Bolta	Agricultural institute of S, ovenia, Central laboratories
Solomon Islands	Marvin	Baekisapa	Solomon Islands National University Science Laboratory

Solomon Islands	Marvin	Baekisapa	Solomon Islands National University Science Laboratory
Solomon Islands	Merald	Ajo	Faculty of Agriculture, Forestry & Fisheries Science Laboratory
Somalia	Abdirahman Ibrahim	Mohamed	Sahan agriculture research center
Spain	Miquel	Aran Mayoral	Sociedad Española de Ciencia del Suelo
Spain	Beatriz	Salvador	Biome Makers
Spain	Jorge	Batlle-Sales	INSAS Chair. University of Valencia, Spain
Sudan	Abdelmagid		Soil Analysis Laboratories Unit (SALU)
Sudan	Nuha	Khamis	Soil Analysis Laboratories Unit (SALU)
Sudan	Mohamed	Dafalla	Mohamed Salih Dafalla
Sudan	Faiza	Khair	Faiza khair
Syria	Manhal	Alzoubi	Syrian labs
Syria	Riham	Zahalan	Vice-Chair NENA Lab
Thailand	Somsak	Maneepong	Walailak University
Thailand	Charirat	Kusonwiriawong	Department of agriculture
Thailand	Napassawan	Sunthorn	Soil, Fertilizer and Plant Analysis Laboratory
Thailand	Nopmanee	Suvannang	Land Development Deaprtment
Thailand	Juthamard	Kaiphom	Soil analysis technical service group
Togo	Gbénonchi	Mawussi	Laboratoire d'Analyse des Sols et des Végétaux de l'Ecole Supérieure d'Agronomie - Université de Lomé
Trinidad and Tobago	Gabrielle	De Souza	Soil and Analytical Services Laboratory
Tunisia	Rafla	Attia	LCAS
Tunisia	Besma	Zarai	LRVENC

Tunisia	Marwa	Zouari	LR16INRGREF, non conventional water valorisation, Tunis
Tunisia	Sourour	Mzahma	LR valorisation des eaux non-conventionnelles
Turkey	Barış	Aşık	Türkiye
Turkey	Emrah	Ramazanoglu	emrah
Turkey	Ayşe	Çetin	Ayşe Çetin
Turkey	Vecihe	Incirkuş	Soil Fertilizer and water resources central research institue
Turkey	Aynur	Dilsiz	soil fertilizer and water resources central resourch institue
Turkey	Huriye	Bayram	International Agricultural Research and Training Center/IARTC UTAEM LAB
Turkey	Önder	Özal	UTAEM
Turkey	Özge	Şahin	Ankara University Department of Soil Science and Plant Nutrition Soil and Fertilizers Analysis Laboratory
Turkey	Sevinc	Madenoglu	Ministry of Agricultute and Forestry, GD of Agricultural Research and Policies
Turkey	Atila	Polat	Soil fertilizer and water resources central research institute
Turkey	Yağmur	Kaya	Tokat Gaziosmanpaşa Üniversitesi Toprak Analizleri Laboratuvarı
Turkey	Oğuz Can	Turgay	Oğuz Can Turgay
Turkey	Seda	Bice Atakli	TOGU Ziraat Fakültesi Toprak Bilimi ve Bitki Besleme Bölümü Lab.
Ukraine	Oksana	Samkova	Ukrainian Laboratory of Quality and Safety of Agricultursl Products
United Kingdom	Charles	Gowing	British Geological Survey
United Kingdom	Michael	Watts	British Geological Survey

United States of America	Faisal	Sherif	Fee lab at Michigan State University
United States of America	Chris	Lee	Kellogg Soil Survey Laboratory
United States of America	Rich	Ferguson	Kellogg Soil Survey Laboratory
Uruguay	Ana	Silbermann	Laboratorio Suelos DGRN-MGAP
Uruguay	Irene	Purtscher	Laboratorio Suelos, Plantas y agua, INIA
Uruguay	Mauricio	Silvestri	Laboratorio Kemia
Vanuatu	Junior	Salong	Vanuatu Agriculture soils lab
Venezuela	Lucas	Peña	Laboratorio de Suelos, Aguas y Plantas INIA Tachira
Vietnam	Do Duy	Phai	Central Analytical Laboratory - Soils and Fertilizers Research Institute
Yemen	Mohammed	Al-Mashreki	Soil, water, plant and fertilizers laboratory
Zimbabwe	Takesure	Tendayi	Soil Science & Environment, University of Zimbabwe
Zimbabwe	Washington	Mutatu	Agricultural and Industrial Research Laboratory
Zimbabwe	Thembinkosi	Mbedzi	University of Zimbabwe

## Annex III. Terms of Reference for the governance of the Regional Soil Laboratory Networks

### ***Background***

In November 2017, the [Global Soil Laboratory Network \(GLOSOLAN\)](#) was established to build and strengthen the capacity of laboratories in soil analysis and to respond to the need for harmonizing soil analytical data. GLOSOLAN is organized into [Regional Soil Laboratory Networks \(RESOLANs\)](#), the skeleton of GLOSOLAN. After the successful establishment of the Regional Soil Laboratory Network for Asia ([SEALNET](#)) in 2017, Latin America ([LATSOLAN](#)) in 2018, and the Pacific ([ASPAC](#)), Africa ([AFRILAB](#)), Europe and Eurasia ([EUROSOLAN](#)) in 2019, GLOSOLAN successfully launched the Regional Soil Laboratory Network for the Near East and North Africa ([NENALAB](#)) on 9 June 2020.

At the moment of their launch, each RESOLAN decided to adopt different governance depending on their perceived needs (TORs available in the Annexes of the first RESOLAN meeting report). However, during the 2021 annual meetings, all RESOLANs agreed on the need to adopt a common governance based on the most successful governance model adopted by the regions over time. In this regard, the decision for all RESOLANs to have one Chair, one or two vice-Chairs, and a Steering Committee was made.

### ***RESOLAN Chair***

Each Regional Soil Laboratory Network is led by a Chair that works in coordination with the RESOLAN vice-Chair(s), the RESOLAN Steering Committee and the GLOSOLAN Coordinators at the Global Soil Partnership. The term for the Chair is two years after election, extendable to a second term during the annual RESOLAN meeting.

The RESOLAN Chair is tasked to:

- i. Contribute to the preparation of the annual RESOLAN meetings and lead their implementation;
- ii. Develop and implement the RESOLAN work plan with the support of the RESOLAN vice-Chairs, the RESOLAN Steering Committee and the GLOSOLAN coordinators;
- iii. Maintain active communication with GLOSOLAN, the GSP Secretariat and the GSP's Pillar 5 Working Group, in relation to the implementation of the RESOLAN activities. In this regard, the RESOLAN Chair is responsible for bringing regional needs and priorities to the attention of the above mentioned bodies;
- iv. Support National Reference Laboratories in the region to establish their National Soil Laboratory Networks (NASOLANs) and to define and implement NASOLAN activities;
- v. Support the GLOSOLAN Coordinator in evaluating the compliance of the National Reference Laboratories to their [Terms of Reference](#), and help identifying the best candidate to replace those laboratories that do not comply with their mandate;
- vi. Represent the RESOLAN at official national and international meetings and events;
- vii. Contribute to the mobilization of financial resources to execute RESOLAN activities with the support of the RESOLAN Vice-Chair(s), the regional Steering Committee, the GLOSOLAN Chair and Vice-Chair, and the GLOSOLAN Coordinator.

### ***RESOLAN Vice-Chair(s)***

Each RESOLAN Chair is supported by one or two vice-Chair(s) that are tasked to assist the Chair in complying with his/her mandate. The number of vice-Chairs relates to the need to overcome cultural and language barriers, which may be present between laboratories operating in the same region. The vice-Chairs are elected during the annual RESOLAN meetings. Their mandate is two years after election, extendable to a second term.

### ***RESOLAN Steering Committee***

In order to provide sufficient support to countries, the decision to establish a Steering Committee was made. In this regard, the Steering Committee is tasked to:

- i. Support the RESOLAN Chair and Vice-Chair(s) in implementing the activities and work plan defined during the RESOLAN meeting;
- ii. Provide suggestions on how activities in the RESOLAN work plan should be adapted to particular situations within the region;
- iii. Demonstrate their commitment to the successful implementation of GLOSOLAN activities;
- iv. Support the RESOLAN Chair and Vice-Chair(s) in assessing the compliance of the National Reference Laboratories to their [Terms of Reference](#), especially regarding the establishment of the NASOLAN and the implementation of national work plans;
- v. Support the GLOSOLAN coordinators in organizing capacity development sessions by proposing training topics tailored on regional needs and by identifying potential trainers among RESOLAN members and other experts from the region;
- vi. Define indicators to monitor and assess the performance of GLOSOLAN members.

The Steering Committee is composed of maximum seven persons, depending on the number of countries and laboratories in the region. The members of the Steering Committee are selected by the RESOLAN Chair and vice-Chairs, the GLOSOLAN Chair and vice-Chair and the GLOSOLAN Coordinators based on the following criteria:

- They should be the most-active members of the RESOLAN;
- They should have high technical skills in order to provide sound advices on the activities to implement in the region and provide technical advices to countries as needed;
- They should have good social skills in order to smoothly communicate with laboratories in their RESOLAN and trigger cooperation between laboratories and countries;
- They will be selected based on their language skills as needed. This applies to regions like Africa (need for English and French), the Near East and North Africa (need for French and Arabic), Latin America and the Caribbean (Spanish, Portuguese and English) and Europe and Eurasia (need for English and Russian) where there is the need to overcome language barriers.

Members of the Steering Committee will be identified assuring gender and geographic balances. The experts identified by the RESOLAN Chair and vice-Chairs, the GLOSOLAN Chair and vice-Chair and the GLOSOLAN Coordinators to take the position will be presented at the RESOLAN meetings. Ultimately,

RESOLAN members will be asked to approve/reject the candidates. The term of the RESOLAN Steering Committee is two years extendable to a second term.

The RESOLAN Chair, Vice-Chair(s) and the Steering Committee meet on a regular basis in order to assign tasks, review progresses, and ensure the active participation of all countries in the region to RESOLAN and GLOSOLAN activities.

## Annex IV. Terms of Reference for the GLOSOLAN Technical and Steering Committees

### ***Background***

Since its establishment in 2017, the Global Soil Laboratory Network (GLOSOLAN) work on building and strengthening the analytical capacities of soil laboratories worldwide while harmonizing methods and data. In 2021, the network reached 800 members. Thus, GLOSOLAN expressed the need to review and strengthen its governance in order to answer an increasing number of requests for support, and better allocate the time of the experts working on GLOSOLAN publications and trainings. Additionally, GLOSOLAN expressed the need to support its Chair, vice-Chair and coordinators at the GSP in monitoring the implementation of GLOSOLAN activities and in developing the GLOSOLAN work plan. In this regard, GLOSOLAN decided to establish a Technical and a Steering Committee.

### ***GLOSOLAN Steering Committee***

The Steering Committee is tasked to:

- i. Support the GLOSOLAN Chair and Vice-Chair in monitoring the achievements, progresses and needs of the network;
- ii. Contribute to the review and update of the GLOSOLAN ten years work plan;
- iii. Support the GLOSOLAN Chair, Vice-Chair, and Coordinator in identifying priority areas of work and in overcoming regional and eventually national differences;
- iv. Advise GLOSOLAN on its communication strategy in order to enlarge the network and promote the implementation of GLOSOLAN activities and the use of GLOSOLAN products;
- v. Support the GLOSOLAN Coordinator in mobilizing financial resources.

The Steering Committee is composed by the GLOSOLAN Chair and vice-Chair, the GLOSOLAN coordinators, and maximum five advisors selected based on the following criteria:

- They should have a good knowledge of how the GLOSOLAN network works, its mission and vision;
- They should be the most-active members of the GLOSOLAN;
- They should have high technical skills in order to provide sound advices on the activities to implement and provide technical advices to countries and regions as needed;
- They should have good social skills in order to smoothly communicate with GLOSOLAN members and trigger cooperation between laboratories and countries;
- They should be experts in one of the following areas of work: proficiency testing, standard operating procedures, financial resources mobilization, concept note writing, and communication;
- They should have a good knowledge of financial mobilization strategies in order to support and advice GLOSOLAN on the fund raising.

Members of the Steering Committee will be nominated by the GLOSOLAN Coordinators, ensuring regional, gender and expertise balance. The term of the GLOSOLAN Steering Committee is two years extendable to a second term.

The GLOSOLAN Steering Committee meets on a regular basis in order to assign tasks, review progresses, and ensure the timely implementation of the GLOSOLAN work plan.

### ***GLOSOLAN Technical Committee***

The Technical Committee is tasked to:

- Review the proposals made by RESOLANs and GLOSOLAN on the writing of technical documents and the harmonization of standard operating procedures. Recommendations on the SOPs to include in the annual GLOSOLAN work plan will be presented at the annual GLOSOLAN meeting for endorsement;
- Approve or reject the proposals – decisions, which will be reported to all GLOSOLAN members by the GLOSOLAN coordinator;
- Advise the working groups on how to write the technical documents approved by the Technical Committee.

Anyone interested in joining the Technical Committee can submit an expression of interest to the GLOSOLAN coordinators, using the specific form and attaching the CV. The Technical Committee shall not be composed of more than twenty persons, with at least one representative from each RESOLAN. The term of the members of the Technical Committee is two years, renewable to a second term. Candidates will be selected by the GLOSOLAN coordinators, the GLOSOLAN Chair and Vice-Chairs, and the RESOLAN Chairs on the basis of their knowledge, experience and technical competence (on GLOSOLAN areas of work) as well as their commitment to GLOSOLAN and the time they can devote to the work. Members of the Technical Committee who will not be able to see through their mandate for any reason, will be replaced by another person, maintaining the regional and expertise balance. A member of the Intergovernmental Technical Panel on Soils (ITPS) will be invited to be part of the GLOSOLAN Technical Committee.